

SEVENTY-FOURTH YEAR

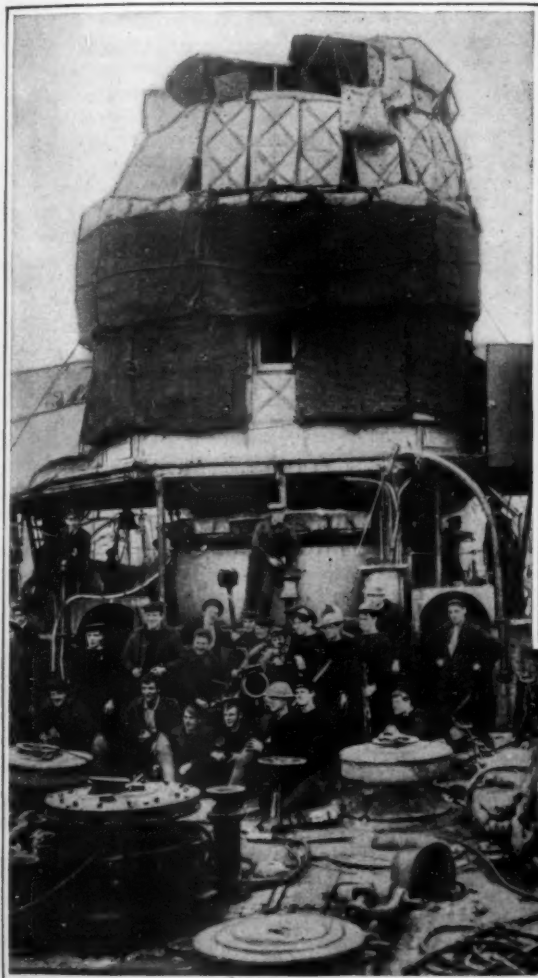
# SCIENTIFIC AMERICAN

THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

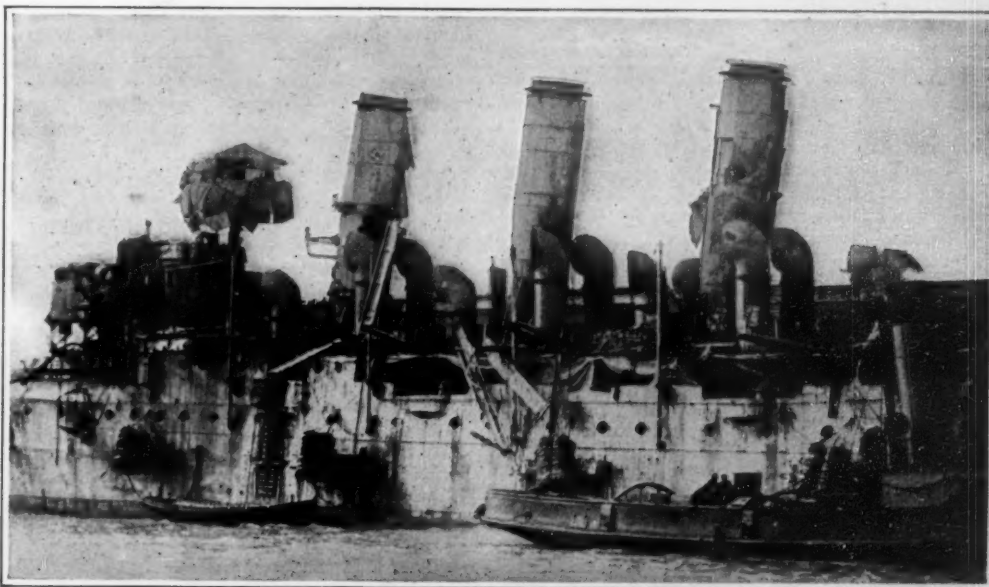
VOLUME CXVIII.  
NUMBER 21

NEW YORK, MAY 25, 1918

10 CENTS A COPY  
\$4.00 A YEAR



Heavy rope mattresses transform the bridge of the "Vindictive" into a conning tower with a single window for lookout



The "Vindictive" on her return from Zeebrugge



One of the Royal Marines of the "Vindictive" in a shell hole in the main deck



"Are we downhearted? No!"



Officers of the "Vindictive". Captain Carpenter with arm in sling

THE HEROES OF TWO SUCCESSFUL RAIDING EXPEDITIONS [See page 486]

Photographs Copyrighted by Underwood and Underwood



# SCIENTIFIC AMERICAN

Founded 1845

Published by Munn & Co., Inc., 233 Broadway,  
New York, Saturday, May 25, 1918

Charles Allen Munn, President, Frederick C. Beach, Secretary,  
Orson D. Munn, Treasurer, all at 233 Broadway

Entered at the Post Office of New York, N. Y., as Second Class Matter  
Trade Mark Registered in the United States Patent Office  
Copyright 1918 by Munn & Co., Inc.  
Great Britain rights reserved

Illustrated articles must not be reproduced without permission

*The object of this journal is to record accurately and lucidly the latest scientific, mechanical and industrial news of the day. As a weekly journal, it is in a position to announce interesting developments before they are published elsewhere.*

*The Editor is glad to have submitted to him timely articles suitable for these columns, especially when such articles are accompanied by photographs.*

## The Turn of the Tide

FOR three years or more, the tide of German U-boat piracy has been setting steadily against the shipping of the Allies. During that stretch of time nearly 12,000,000 tons in shipping and nearly 15,000 lives have been chalked up in blood-red figures to swell the list of Prussian atrocities.

But we have reached the turn of the tide. By the time these words are read, the increasing toll which is being taken of German submarines and the decreasing toll of destroyed allied ships will have brought us to the point where we are putting ships afloat faster than the submarine is sinking them.

The Prussian is highly efficient, and never more so than when he sets out to lie; and German officialdom is lying to the German people about the submarine situation. It is magnifying the allied shipping losses in an ever increasing ratio, and it is minimizing its own losses of submarines in equal measure.

Vice-Admiral Sims recently referred to the fact that the submarine campaign reached its highest point in April of last year, and that it has been steadily declining ever since; so that in December of last year losses were 386,000 tons, and in April had declined still further to 269,000 tons. The German authorities, however, have more than doubled these figures in the lists sent out to the German people. Thus, Germany claimed for December, 702,000 tons sunk as against actual losses of 386,000 tons; in January, the claim was 632,000 tons—the actual loss was 302,000 tons; in February she claimed 689,000 tons—the true figure is 332,000 tons; in March, she claimed 680,000 tons as against 358,000 tons; and in April, when 269,000 tons were sunk the German people, their precious collection of allies and any one else who believes that Germany is capable of speaking the truth, were given to believe that 600,000 tons were sunk.

It is gratifying to compare the April loss for this year of 268,000 tons with the April loss of last year, which was the first year of unrestricted submarine warfare, when the submarines sunk a total of 871,000 tons.

The French Minister of Marine, Georges Leygues, draws attention to the fact that, if the total of allied shipping destroyed in the first four months of this year, as given above, were to be maintained throughout the year, the year's total losses would be about 3,700,000 tons; and he notes that this is less than the estimated amount of tonnage which our Shipping Board expects to build in the same time. So we see that, even in the unlikely event of the Germans being able to maintain their present rate of sinking, the losses will be more than offset by the American effort. Consequently, since Great Britain, France and Japan will launch this year between them about 2,000,000 tons, and the chartered Japanese and Norwegian ships and the requisitioned Dutch vessels amount to over 1,000,000 tons, there will be a total of gain for the year for the allied cause, of over 3,000,000 tons of shipping. It is probable, however, that the destruction of German U-boats will proceed at an accelerating rate for three reasons: First, the convoy system, which is all the time being perfected in its tactics, is becoming increasingly efficient; second, during the year there will be an enormous addition to the anti-U-boat fleets due to the completion of the destroyer and chaser programs, both of Great Britain and ourselves; and thirdly, because strongly offensive operations, of which the recent raids against Zeebrugge and Ostend, are a fair test, will be prosecuted throughout the year.

## We Should Enlarge Our Shipbuilding Program

THE man of genius is preeminently the man with a strong sense of proportion, and the genius of Charles M. Schwab is certainly marked by this quality. In his particular field of activity he has always shown that he was so deeply occupied with the essentials that he had no time to bother with the non-essentials. His vision has always taken in a wide field, and to this, no doubt, his success is largely due.

It is because he is looking at the shipbuilding question

with the same broad vision that he has expressed himself in favor of making a 60 per cent increase in our shipbuilding facilities—and doing it now! In urging immediate action, he has in mind the fatal error of last year, when we delayed construction of our more important yards until the good building weather had gone by. The great cost of the Hog Island Shipyard, as we all now know, was due to the fact that its enormous constructive operations had to be carried on in the severest kind of winter weather. So, in his plans for immediately extending the ways in the existing yards, and for the construction of new yards, Mr. Schwab should be able to command the earnest coöperation of Congress, and of everybody else concerned in our huge shipbuilding venture. The enlargements can be made and new yards completed, if we start at once, before the winter weather; in which case, the delivery of steel and the fabrication of the ships can go on without interruption throughout the months of inclement weather.

Mr. Schwab mentioned one important element entering into rapid shipbuilding on a big scale, which we confess has been causing us some anxiety—namely, the building of the engines and the accessories. The demand for these will be simply enormous; and it would be well for the Shipping Board at once to make a fresh inventory of the shops and factories which can do this work, and get them started upon it with the least possible delay.

"The two disturbing questions in this matter," says Mr. Schwab, "are those of fuel and transportation." Well, those questions are up to Mr. McAdoo and Dr. Garfield; and it is to be hoped that they, as well as the Shipbuilding Corporation, have laid well to heart the lessons of the past winter.

## The Helpless Dollar

SOMEONE—was it Napoleon?—once said that to wage a war successfully three things were necessary: money, more money, and still more money. There is, of course, a deal of truth in this statement; but for all that, it is in a way misleading.

When a nation buys war supplies abroad, money is a paramount necessity. England and France, for instance, before our entry into the war, purchased from us with real cash vast quantities of war supplies. And if it were possible for a nation to carry on a war wholly with supplies brought in from abroad, money would be sufficient as well as necessary.

But at the present moment it is not possible for the United States to use money, on any great scale, in buying goods from other nations, for the simple reason that the entire commercial world is now at war. With all his money, Uncle Sam can buy supplies only from himself. There are, of course, exceptions to this general statement, such as nitrates and rubber; but substantially speaking, we must produce all the things which we are to use in the war, produce them ourselves.

Now this state of affairs has a double significance. In Germany, where it governs even to a greater extent than here, it means that money is superfluous so long as there is credit. The German government has so far succeeded in maintaining its credit at home; and paper marks are discounted only in rising prices. The same condition holds everywhere, and will continue to hold; every people has sufficient confidence in its own government to accept its promises to pay; the distinction between cash and credit is temporarily lost.

On the other hand, when Uncle Sam begins to buy supplies from himself, his purchasing power is limited neither by his wealth nor by his credit, which are both inexhaustible. Nevertheless, his purchasing power is limited—he can buy from himself only so much steel and explosives and ships and wool and wheat as he produces. Credit can be extended only in terms of dollars and cents; short selling is possible only in terms of values. Neither credit nor short selling will bridge a gap in production. Uncle Sam can get credit far beyond his immediate ability to pay; he can go through the motions of buying as much as he pleases of any commodity. But he cannot transform printing-press dollars into munitions, or eat the wheat that has been sold to him in excess of the year's crop.

The consequence of all this is that the man who subscribes to bonds and stops there does but half his duty. To be sure, he has done his necessary part in enlarging the Government's credit, but what of it? What is the use of credit, if there is nothing to use it for? If we all confined ourselves to buying bonds, Uncle Sam would have enough money to win the war several times over; but he would have no way of winning the war with it, because there would be no way for him to spend it.

Accordingly, after we have bought our bonds, it behooves us to discharge the other part of our obligation—to do our share toward increased production. The demand for everything has increased, yet there is a smaller body of productive workers to meet that demand. Production per worker must increase, and many who have been non-productive must join the ranks of the producers. Every individual among us is, in his own

sphere, however small that be, responsible for bringing it about that when we go shopping with our war budget there shall be full counters for us to select from. Every shirker puts a further load upon the workers.

The dollar that can't be spent is helpless, worthless. Some of our billions will become that sort of dollar, simply through lack of something to buy with them. How many of our dollars will meet that fate? How many extra soldiers must we send over, how many of those we send must we sacrifice needlessly, through failure of those left at home to buckle down to work and make something for every dollar to buy? If the whole nation can but be awakened to the situation, the number of vagrant, jobless dollars will be a minimum. Let us hope that the awakening comes, and in time.

## Unshackling the Exporter

THE Webb Law, permitting combinations in export trade, which was approved April 10th, is an important and necessary step in our preparation for meeting the conditions that will prevail in international commerce after the war. For while we have indeed built up an export trade of magnitude, our manufacturers have been handicapped by the uncertainty in the application of the Sherman and the Clayton Acts to combinations and associations of exporters. The Webb Law recognizes at last that in foreign trade coöperation is a necessity in order that merchants of this country may trade on an even basis with foreign competitors, while not obliged to compete with one another. It allows exporters the freedom of contract necessary for their protection in this respect, and at the same time places ample check on unfair methods and abuse.

In view of the present demands from abroad for American goods the measure must rank as a most significant after-the-war measure. For while our exports have leaped from two and a half billions in 1913 to six and a quarter in 1917, this remarkable increase has been due to the abnormal conditions created by the war. These, of course, cannot be expected to continue. When the war ends and trade resumes its normal course, the extraordinary demands from all quarters of the globe for our products will inevitably be lessened. The nations which are now busy fighting will go back to work; their merchants will again meet our manufacturers and producers in competition in the world's markets. If we are not to break down against this competition, it is essential that our exporters be placed on equal terms with their foreign contemporaries. The Webb Law does this for them, by giving them the privilege of association which they have never before enjoyed, with all its advantages.

It will now be possible for American exporters to maintain highly organized special service at minimum cost to the participants—service which would be out of the question if each man had to maintain it for himself alone. Credit information and the financing of foreign sales will be improved, reforms in shipping effected second only to those instituted within our boundaries by Government control of railroads, more advantageous traffic contracts will be obtained, and greater and more regular tonnage will result, with superior facilities for customs brokerage, warehousing, etc.

Survival of the initial losses which are sometimes incurred before American goods gain a foothold, and which are fatal to an individual company, will be easier; and this will lead to more persistent effort to export. Finally foreign business can be divided upon an agreed basis, a basis best adapted to the mutual interest of all participants from the standpoint of sustained labor employment. This will enhance our ability to produce at a price to meet foreign competition; for with the scale of wages in America higher than anywhere else in the world, our excessive cost of production in this regard can be offset only by greater efficiency in manufacture and distribution. Combination in foreign trade will be conducive to economic distribution and thus aid materially in overcoming our one great initial disadvantage.

Coöperation and association may be indulged in various ways under the new law. Common selling agencies may be formed; agreements may be made concerning the handling of goods, the time and manner of shipment, and the manner of packing; agreements may be entered into regarding the kind of goods to be manufactured; agencies may be established for the investigation and study of the needs and demands of foreign markets; and, in fact, any combination or association formed or agreement made which will aid the exporter but which will not be in restraint of trade within the United States. Through such agencies as the above it is that foreign countries have built up their trade; and our manufacturers and producers must prepare for fierce competition in the world's markets after the war by means of such coöperation. It is to be hoped that we will not be driven to any such ruthless methods as those adopted by the great German syndicates in their search for monopoly; but it is plain that, to meet these methods, we must have such a tool as the new law gives us.



## Naval and Military

**A Ship Every Two Days.**—It was recently announced that the 28th keel had been laid at the Newark yard of the Submarine Boat Company. This means that every one of the 28 ways is occupied. Several of the vessels are nearing completion, and launching will begin at an early date. The question of speed of construction is now entirely one of delivery of steel and other materials.

**Cooperation of American and British Navies.**—Admiral Sir Lewis Bayly, Commander-in-Chief of the British Naval forces on the Irish Coast, has issued the following order, addressed to the American destroyer flotilla: "On the anniversary of the arrival of the first United States men of war at Queenstown I wish to express my deep gratitude to the United States officers and ratings for the skill, energy, and unfailing good nature which they all have consistently shown, which qualities have so materially assisted in the war by enabling ships of the Allied powers to cross the ocean in comparative freedom. To command you is an honor, to work with you is a pleasure, to know you is to know the best traits of the Anglo-Saxon race."

**Building Submarine-Proof Ships.**—The Foundation Company of this city has undertaken to build at a new yard near New Orleans five unsinkable steel cargo boats which recent tests of an experimental boat have satisfied naval architects will be submarine-proof. The vessels, of 4,200 tons, will consist of two parallel cylindrical shells, entirely distinct from each other, and each subdivided by transverse bulkheads. The two hulls will be connected by a plated steel structure which will provide a third water-tight section; and the arrangement is such that, in case of either hull being breached by a torpedo, the whole vessel will remain on an even keel, and be safe against that loss by capsizing, which is so frequent in torpedoed ships of standard construction.

**In Charge of Gun Construction.**—The Administration is realizing the importance of putting men of wide experience in big business in charge of our preparations for war. Schwab has already greatly stimulated our shipbuilding, and the appointment of Stettinius to take charge of the production of ordnance is a step, the necessity for which has long been realized throughout the country. Under the new arrangement, the designing of ordnance will be left in the hands of the Ordnance Department, in the control of which General Crozier has been succeeded by a younger man, and the task of translating the plans of the Bureau into factories, plants and ordnance of all kinds will be left to the well-proved administrative genius of Mr. Stettinius.

**Anti Aircraft Defenses for New York.**—Although at present there seems to be no immediate threat of an aerial bombardment of New York and other important maritime cities, the decision of the War Department to provide anti-aircraft defenses is commendable. The war has been full of surprises and prudence demands that we look far ahead. Concrete emplacements for mounting anti-aircraft guns are to be constructed in various centers of New York City as a part of the general scheme for protecting the city from possible enemy air raids. Contracts have recently been awarded for this work, which is being done under the direction of Brig.-Gen. Bingham, U. S. A., who is in charge of the defensive work at the eastern and southern entrances of New York harbor.

**New Government Gun Plant.**—The United States Steel Corporation and the Government are to cooperate in the erection and operation in the Pittsburgh district of what will be one of the largest gun plants in the world. Following its former policy of not producing munitions directly but rather contributing raw materials, the Steel Corporation's part in the new enterprise will consist of the erection of the steel works, which will supply munition and ordnance plants. The Corporation has begun the erection of the gun-forging plant and has enlarged its armor-plate department to provide for the manufacture of forgings for heavy guns. The Crucible Steel Company is extending its plants at Harrison and Syracuse, both of which are producing large quantities of steel for rifle barrels and other ordnance.

**Plenty of Ship Workers.**—The United States Emergency Fleet Corporation states that the March total of ships contracted for is 1,227, composed of 443 wooden ships, 723 steel ships, 58 composite ships and three of concrete. Shortly, monthly comparisons of tonnage produced in the American and British yards will be issued; but it must be remembered that the British figures will be given in gross tons and the American figures in deadweight tons. The proportion between the different kinds of tonnage is: net tonnage 1,000; gross tonnage, 1,500, and deadweight tonnage 2,250. During five months past, including March, American yards turned out 388,516 deadweight tons and British yards 452,572 deadweight tons. There were 230,000 men employed in American yards on March 24th. There is now no shortage of labor in our shipbuilding except as regards highly skilled men, the drive for shipbuilders having proved very successful from the time when labor was made to understand the true situation.

## Science

**South African Seaweed to Yield Potash.**—According to a paper by G. F. Britten in the *South African Journal of Science*, the species of seaweed known as sea bamboo, which grows in great abundance along the shores of South Africa, is a promising source of potash, and Mr. Britten urges that a careful survey be made to determine its distribution.

**The American Association for the Advancement of Science** will probably hold its next meeting in Baltimore instead of in Boston, as had been planned. While many members of the Association who belong to Boston are absent on war work, the number of scientific men now at work in Washington is far greater than in normal times, and Baltimore is conveniently near to Washington.

**Concrete Structures in Sea Water.**—The U. S. Bureau of Standards has been collecting data from harbors in various parts of the world concerning the effects of sea water on concrete. The Bureau finds that practically all reinforced concrete structures in sea water are failing, because of improper design, which leads to the corrosion of the reinforcement, and the designs advocated in current engineering practice will not ensure permanent or durable structures.

**Radium Content of Sea Salt.**—Samples of sea salt collected by the "Carnegie" during her last voyage in the Pacific Ocean and the subantarctic regions have been examined for their radium content by Mr. C. W. Hewlett. The amount of radium was found to be negligibly small compared with the values that have been found by Joly and others for salt collected near land, and this result is in accordance with the prevailing view that the radium content of sea salt diminishes with increase of distance from land. A report on these investigations has been published in *Terrestrial Magnetism*.

**Malaria in Venezuela.**—According to a report to the U. S. Public Health Service, malarial fevers are by far the greatest scourge of the rural districts of Venezuela, and the prevalence of such affections is attributable to the striking scarcity of physicians and of quinine away from the towns. In the one state of Carabobo, with a population of 198,396, there were 1,484 deaths from malaria last year. Two years ago the severe outbreak of malarial fevers near Maracay, an important town in the State of Aragua, disclosed the fact that within an hour's distance of that place, and on the principal railway of the republic, thousands of people were living without medical attendance when needed. Physicians had to be sent from Caracas and other cities and every ounce of quinine used had to be brought from a distance.

**Turbidity.** says the last annual report of the Bureau of Standards, is the quantitative measurement of turbidity. Since a medium is made turbid by the presence of minute particles in suspension, which scatter light in all directions, the quantity of scattered light may be taken as a measure of turbidity. Following out this idea, the Bureau has devised a turbidimeter which shows turbidity in even the purest doubly distilled water. The turbidity of relatively clean air is quite appreciable. The simplest quantitative meaning that can be attached to the word turbidity used in an optical sense is the fraction of the incident light scattered by a turbid medium in a particular direction. This definite optical quantity is measured by the new instrument. The report states that the turbidity standard used in water analysis, as a guide to the efficiency of municipal filtration systems, has long been regarded as unsatisfactory. The Bureau has accordingly secured samples of standard turbidity from water laboratories representing the state and city boards of health and has been making intercomparisons of these, which will show the variation in the standard now in use. Eventually the Bureau will be in a position to furnish a uniform standard of turbidity to the entire country.

**The Rainiest Place in the World?**—The reputation of being the rainiest place in the world has long been enjoyed by the hill station Cherrapunji, on the slope of the Himalaya, in Assam, with a mean rainfall that has been variously stated, according to the length of the record and the particular rain-gage in question. The latest official value, based on a 40-year record at the Cherrapunji police station, is 426 inches per annum. Blanford, the well known authority on Indian meteorology, thought that the mean in some places at Cherrapunji exceeded 500 inches, but nowhere amounted to 600 inches. So far as actual records go the rainfall at the Indian station is surpassed by that recently reported by D. H. Campbell, of Stanford University, as having been measured at Waialeale, in the island of Kauai, Hawaii, though the record covers only five years and the mean might be reduced by a longer period of observation. During the years 1912-1916 inclusive, the Hawaiian station, which is 5,075 feet above sea-level, recorded the astonishing mean annual rainfall of 518 inches, or more than 43 feet! Mr. Campbell says that Waialeale is seldom free from rain clouds and the precipitation is almost incessant; hence the whole surrounding region is a bog, bearing low trees thickly draped with dripping masses of moss and liverworts.

## Electricity

**Why Not Generate Power at Mines?**—Fuel Administrator Garfield has authorized a survey to be made to determine the practicability of establishing central generating stations at anthracite mine centers and transmitting electrical energy to industrial centers at New York and other seaboard cities instead of transporting coal. If feasible, the project will be financed by the Government. It is planned to link up this system of transmission with all vital centers in addition to New York within a radius of 150 miles. Low grade coals will probably be used.

**New Swedish Radio Station.**—At Karlsborg, Sweden, a wireless station has been completed which is capable of sending messages over a distance of 3,150 miles. The masts, weighing only 25 tons each, are 684 feet high. They are insulated at four different places from the base to top and are erected with the bases embedded in black granite blocks, impregnated with paraffin. The aerials, continues *Schweizerische Bauzeitung*, are 1,476 feet long and composed of 60 phosphor-bronze wires hung from steel tubes. The capacity of the station is increased by covering the territory between the masts with a phosphor-bronze wire netting.

**Maintenance of Electric Locomotives.**—The ease with which the most recently designed electric locomotives can be maintained and supervised was somewhat strikingly illustrated by a description, in a recent issue of the *Electric Railway Journal*, of the experiences of the Butte, Anaconda & Pacific Railway. This is mentioned as the first indication that 2,400-volt direct-current system can be applied to great tonnage. Trains of 75 ore-laden cars, each averaging 68 tons or more, are not uncommon. There are now 26 of these locomotives in use, those of the freight type weighing 82 tons each. There are also three tractor trucks of about half this weight. It is also stated that the electrical maintenance of all the locomotives and tractor trucks is undertaken by three men, two electricians and an assistant. This small staff does all rewinding, and only one commutator was sent to the factory. The staff also attends to car heating and lighting equipment. It is remarked that it would hardly be possible for the supervision to be done by so few men on a steam system. Passenger locomotives are inspected electrically and mechanically every 14 days, and freight engines every 30 to 40 days. In actual practice not more than one hour per unit is required from each electrician at the period of inspection.

**High Candle Power Projection Incandescent Lamps.**—A good deal of work on the design of incandescent lamps for projection work has recently been carried out in Germany. According to a contribution by Mr. O. Kruh in *Elektrotechnik und Maschinenbau*, it has been found possible to make lamps taking up to 200 amperes, and giving 30,000 to 40,000 hefner candles, while even 100,000 candles is considered practicable, the chief limit being the size of the lamp bulb. The great difficulty hitherto in constructing such high candle-power lamps has been the leading-in wires. It is not easy to secure an airtight joint for such high currents, but according to the author this can be done by a special method, which, however, he does not disclose in this article. Such lamps work at about 0.25 watt per candle (hefner). The filaments are mounted in the form of straight bars, as close together as possible, and their useful effect is increased by the use of concave mirrors behind the filaments, the latter being at the center of curvature of the mirror. The mirror can be so adjusted that the image of the filaments completely fills the interstices between them. We have thus a practically homogeneous source, the intrinsic brilliancy of which, it is contended, closely approaches that of the carbon arc crater.

**Telegraph Practice Set for Alternating Current** is now available, consisting of a steel lever key, an alternating-current sounder, and a transformer, all mounted on a base, and equipped with a six-foot cord and standard attachment plug. It is designed for use in telegraph schools, home practice, and private lines. It can be used on the 110-volt, 60-cycle alternating-current lighting circuit by screwing the attachment plug into the nearest lamp socket. Two or more instruments may be connected in series just the same as instruments with battery, by attaching the primaries of the transformers in multiple to the 110-volt, 60-cycle lighting circuit with the secondaries and the sounders in series. This is done by simply screwing the attachment plugs into lamp sockets and connecting the instruments in the usual way, through their binding posts or terminals. Two terminals or binding posts and a single switch are mounted on the base of each instrument. When it is desired to operate two or more instruments on a line the terminals are used for connecting the instruments in series. When used this way the single-point switches should be left open. Closing a switch localizes the instrument so that it can be used for practice without interfering or being interfered with by other instruments on the line.



# Our Winged Postmen

## Completing Our Postal Progress with First Aerial Mail Route Between Washington and New York

AIR mail service is at last a reality with us. On Wednesday, May 15th, last, the first trip was made by an airplane carrying mail between Washington, D. C., Philadelphia and New York city, thus firmly establishing the air mail service as an American institution and placing us on a par with other leading nations which have either inaugurated similar systems or made all the necessary arrangements for aerial mail following the termination of hostilities. The idea is by no means new; several times in the recent past it has been brought before our Government only to be neglected and forgotten through lack of necessary funds. Test flights have been made in the past, but even these, successful as they have been, failed utterly to bring forth the required appropriations from Congress. But the past is past and now we are to have as a permanent institution a fast mail service between the cities already mentioned, with airplanes as the carriers and military aviators as the postmen.

### The Early Beginnings of the Postal Service

Far from being a latter-day institution, the postal service in some form or other dates back to distant past. We are told by historians that the Persians under Cyrus had mail service in the sixth century before Christ. At that time mail was handled by couriers who were provided with the finest and best groomed horses in the empire for just that purpose, so important was a rapid and positive means of communication considered by the ruling body. Roads were marked with posts, and relay stations were established at suitable intervals, perhaps every 25 miles. Obviously, the relay arrangement was resorted to, so that a rider dashed between one station and the next, where a second rider took over

and carried the mail to still another station, and so on.

For the most part the mail matter comprised dispatches, although some merchandise was carried which might be compared with our present parcel post. In order that no pieces of mail matter might be lost a most elaborate recording system was employed.

Darius, the last king of the Persians, was the first postmaster of record. Before ascending the throne he was in charge of the elaborate and extensive postal system that connected all portions of the extensive Persian empire with the government seat.

Then came the Romans. Having constructed a wonderful network of military roads extending from Scotland to Egypt and everywhere on the continent of Europe and even penetrating far into Asia, it is quite natural that they should have established sooner or later an elaborate postal system. And they did. Couriers were employed in relays, and following the earlier Persian practice the system was only employed by the State: letters and merchandise were not carried for private individuals.

Like much of the earlier civilization which we admire, the postal system of the Romans passed out of existence with the fall of their empire; at least, there does not seem to be evidence of the operation of such a system until the reign of Charlemagne, who in 807 A. D. established a postal service within his realm. But this reform, together with the culture which flourished during his reign, was again lost with the dissolution of his empire.

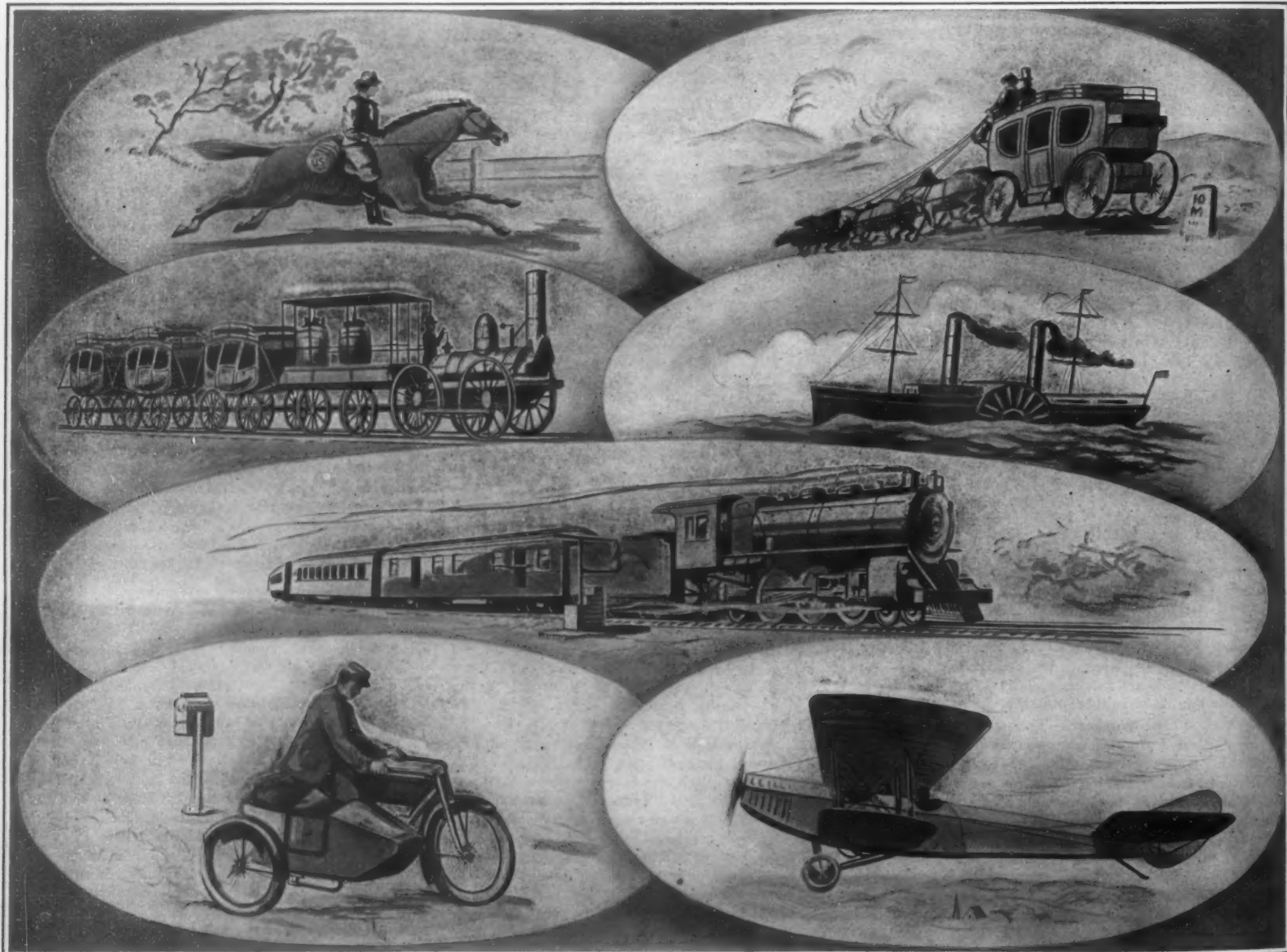
So much for the earlier history. Suffice it to say that during the Middle Ages isolated postal systems persisted here and there and were successful in their limited way. For instance, universities in several of the States of

Europe established and maintained postal facilities, among them being the University of Paris. The students employed runners who, by operating under prescribed schedules, relayed each other and carried mail matter to distant parts of what is now France and Germany. At about this time Marco Polo, the Venetian traveler, reported that letters were carried by riders on horses throughout the Chinese Empire. He estimated that there were then some 10,000 post offices and 200,000 horses involved in the postal service of the Celestial Empire.

### When the Stage Coach Replaced the Horse

The English postal system was the forerunner of our own, and its past history is therefore of interest to us. Perhaps the most striking feature of early postal service in England is the fact that the government used the post office as a means of taxation, with little or no regard for the advantages gained by facilitating correspondence among the people. As a result of this policy—we are told by Daniel C. Roper, writing in his work "The United States Post Office"—the efficiency of the mail service in England was at a low ebb at the time of the American Revolution.

John Palmer, the manager of a theater at Bath, was the reformer whose agitation made the government see the shortsightedness of this niggardly policy. He received the favor of Camden and Pitt, and was finally permitted to carry out his proposals. Coaches designed especially for speed were built and placed in service, good horses and armed guards—robberies had been quite frequent up to that time—were provided, and regularity was insisted upon. As a result, correspondence that had been going by private means was restored to the



Evolution of mail communication in the United States, starting with the pony express and consummated in the postplane

In the order shown the sketches depict the pony express, which served as a means of mail communication in the early days of our National existence. There followed the stage coach, which was a material improvement over the pony express and which persisted until the steam railroad became practical. The early steam trains, such as the famous DeWitt Clinton of 1831 next depicted, were for quite a while but little competition for the more reliable stage coaches. Steamboats had become important means of transporting mail even as early as 1831. With the gradual improvement of steam railroads and with the development of high-speed, reliable trains such as the one shown, mail communication soon reached a high standard of efficiency. For local deliveries and in rural sections, the automobile, particularly the motorcycle with side car, has come into wide use. Finally, and as a consummation of modern mail service, there is the postplane now operating between Washington, Philadelphia and New York.



government posts and the revenue of the English postoffice doubled again in ten years more, when a period of stagnation set in preceding the era of steam transportation and modern postal reform.

Our own postal service originated with the communications between colonists here and their relatives and friends abroad. Masters of ships leaving England for America would undertake for one penny each to see letters safely delivered across the ocean at some reputable tavern or coffee-house where the addressees could call for them. This practice seems to have been profitable, for there were installed in certain coffee-houses in London, receiving bags for letters which were collected by shipmasters before sailing, and carried on board their ships.

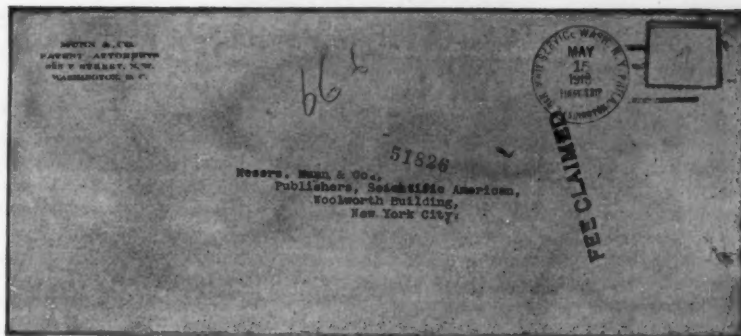
In 1672 the first step was taken toward a domestic post for connecting the several colonies. The first official route established in America was between New York and Boston. The pioneer postman had to travel through the trackless forest, and it was part of his duty to mark the trees for travelers who might wish to follow him. Mail was carried in divers bags, in order to keep together all pieces for a given destination. However, this service was soon abandoned, and for more than a decade no attempt was made to establish a regular post road in America.

The first successful postal system established in any of the colonies was that of William Penn, who in 1683 appointed Henry Waldy of Tekonay to keep a post and "supply passengers with horses from Philadelphia to New Castle or the Falls of the Delaware." It appears also that shortly after this time, posts were in successful operation from Philadelphia to every civilized community in that Quaker colony. Soon postal routes were established in all directions and to all parts of the more densely populated colonies, and horses shortly made way for horse-drawn coaches.

Postal officers of that time, according to Mr. Roper, took special pride in the coach service which was very much to be preferred to the mail riders and sulkies by which the service was maintained in the outlying and sparsely settled sections of the country. It was the policy, as rapidly as the volume of mail increased sufficiently or whenever there was sufficient passenger traffic, to establish stage-coach lines under contract. To facilitate this improved service assistance was given to road-makers and to coach-makers. In 1811 the Government experimented with a line of Government-owned stages between Baltimore and Philadelphia. This line was operated by the Department at less expense than the cost for contract service; but Congress for reasons of public policy, declined to sanction the extension of this principle.

#### The Advent of the Steam Locomotive

By 1813 the steamboat had become an important means of transporting mail. In that year all steamship lines were declared to be post routes. The first steamship crossed the Atlantic in 1819 and by 1825 the opening of the Erie Canal connected the Atlantic coast with the Middle West by water.



This envelope has traveled by postplane from Washington to New York

Mail was first carried by a steam railway in 1834. But it was not until 1838 that a law was passed declaring all railroads to be post routes, and the traveling railway post office did not come until 1840. There followed a period of transition from the stage-coach to railway transportation. At first steam-railway service was far from satisfactory, because railroads had not yet got into the stride which has brought them up to present-day standards. After awhile, however, the many difficulties

tached, the motorcycle affords an ideal and inexpensive vehicle for the rural mail carrier.

#### And Now the Airplane Post

Having proved so effective in the course of almost four years of war, not only for observation and battling purposes but also for bombing, which, after all, is nothing more than a weight-carrying feat over varying distances, the airplane has won world-wide recognition.

Men, far-seeing men, have given much thought to the airplane. What are we going to do with our thousands of military airplanes when once hostilities cease? has been a much mooted question with many leaders of nations. And they have not had far to seek for an answer; for it is self-evident that if an airplane can fly hundreds of miles with a cargo of bombs in all kinds of weather and under the most adverse conditions, surely the same machine can be made to fly with a cargo of mail or light merchandise or passengers in times of peace. War is only a passing condition after all, and such an invaluable means of transportation as the airplane can and must be adapted to more peaceful pursuits when normal conditions again obtain among nations.

So we lead up to the aerial mail carrier, which has already received much attention in Europe. Indeed, rumors reach us from Germany that the Central Empires have established aerial mail routes between important centers, and specific mention is made of that between Vienna and Lemburg, a journey requiring something like 17 hours by express train as contrasted with 7 hours by airplane. In Italy there is an aerial mail service between Rome and Turin, with a saving of time no less noteworthy. In England and in France plans are understood to be well under way for post-bellum air mail routes.

But it has remained for these United States to inaugurate the first aerial mail service really worthy of the name, between New York, Philadelphia and Washington. While we are not strictly the first nation

#### LETTER FROM THE WASHINGTON OFFICE OF THE "SCIENTIFIC AMERICAN" SENT BY THE FIRST AIRPLANE MAIL

To the Editor of the Scientific American:

During the period of over seventy years in which the SCIENTIFIC AMERICAN has been published, the methods of communication from one part of the country to another have undergone many radical changes. Back in the 40's mail matter was still distributed in many parts of the country by mail coach and by pony postal riders and even in canal boats. The delivery of letters by railroad was carried on in the 50's with considerable precision, but the time required to deliver letters to remote sections of the country often consumed many days or even weeks. During the 50's, the electric telegraph had become an established fact, eliminating the element of time in the transmission of messages. This form of communication was extended in 1866 by the laying of the first successful Atlantic cable which closed the ocean gap between this continent and Europe. During the early 80's, the most sensational advance of all was accomplished when human speech was transmitted over a wire.

Then, a decade or so later, the world learned that communication had been established, independently of the cable, by way of the ether; and so, in due course, the dream of aerial transmission between the Old and the New Worlds became a fact.

Since that time no radical change of method has been introduced in the transmission of mail matter, although the time element has been reduced owing to the improved facilities, increased number of railroads, more powerful locomotives and faster steamers.

This letter conveys to you our greetings. It is the first time a letter has been forwarded from one point to another in the United States by regular aerial mail service. It marks the beginning of a new epoch in the mail service of our country.

Yours faithfully,

Munn & Co.

Washington, D. C.  
May 15, 1918

began to disappear, and soon the railroads and the postal service became strongly affiliated.

With more extensive railroad systems our postal service reached out to every part of the country. With better and higher-speed locomotives, the postal time between cities was soon reduced from days and many hours to but a few hours and minutes.

In more recent times other means of transportation have figured in our postal service. The automobile has

to establish an aerial mail service, to be sure, we are undoubtedly the first to inaugurate a regular mail service through the air operating on a rigid schedule and opened to the public. In a practical sense, therefore, we are the first; and as the pioneers we may well be proud to lead in what is bound to be the ultimate means of rapid transportation.

On May 15th last, as we stated earlier in this article (Concluded on page 490)



Loading mail on Lieut. Webb's postplane at Belmont Park



Lieut. Culver, who made the first Philadelphia-New York postplane trip



# Strategic Moves of the War, May 15, 1918

By Our Military Expert

SEVEN weeks have now elapsed since the beginning of the great battle on the western front that was to end the war and to give a peace made in Germany. It is not out of place here to offer a brief summary of what has been done and how the battle lines now stand. The German offensive can be divided up to the present into three phases: first, the great offensive of the German armies operating on the Somme and the Oise from March 21st to the end of the month; second, the first general lull but marked by local actions along the entire line lasting for the first week in April; third, the development of the great thrust in Flanders, which began with a drive at Armentières and in the Lys valley and with the assaults upon the Ypres salient, which led to the capture of Kemmel Hill and which ended on April 29th in the attacks on the line of hills to the southeast of Ypres, repulsed by the British with terrific and bloody losses to the Germans. The last phase now is a general quiet as the Germans are undoubtedly preparing for a new attempt and the Allies equally occupied in making preparations for resisting. While no great battle is now in progress, there is much local fighting and heavy artillery firing on both sides. These have been largely on the Amiens front both north and south of the Somme with the advantages resting generally with the Allies. From these attacks, the British especially have greatly improved their situation by capturing and holding vantage points of high ground. There is a general belief that the great blow, which the Germans must deliver in accordance with the statements and promises made to the people of Germany when the great drive was started in March, must come soon if at all.

There is naturally great activity displayed by them in the sector around Ypres which may possibly be a prelude to a forward thrust there or it may be a move to distract attention from a formidable drive intended to strike elsewhere.

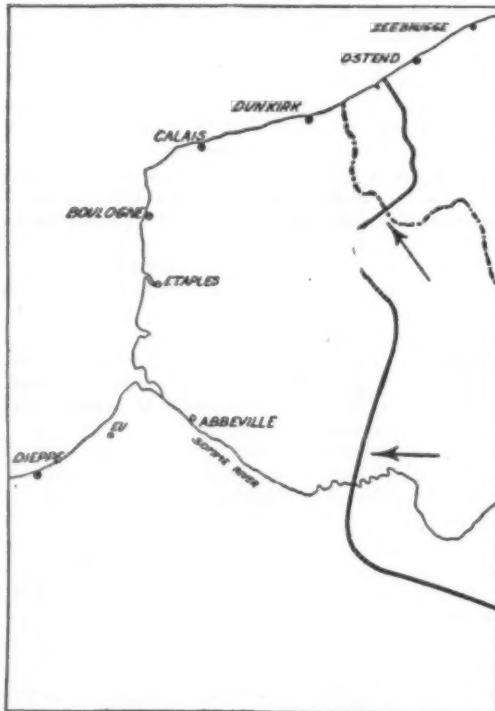
As stated in the last review, everything points to a strong attack from the German armies now concentrated in the Arras sector. At the time of the drives toward Amiens on the south and toward Hazebrouck and Bailleul on the north, a number of divisions were moved from this vicinity to assist; but these have been replaced by other troops and the number assembled there is undoubtedly very large. From the Arras sector, if a German victory could be attained, they could then move either to outflank Amiens or could turn toward the coast; it is more than probable that the latter direction would be taken as the French and English forces would then be separated from each other. On the other hand, the strong stand made by the English and French has given them time to consolidate their own positions by strengthening their defenses as well as by bringing up reinforcements and supplies, so that they are now well prepared to meet further onslaughts.

The Germans have held on so far to their gains; but their positions are far from the best either for attack or defence or for bringing in supplies; they will soon be forced either to go forward or to move backward. There is also little doubt that they may be forced to a hurried decision in view of the constantly increasing strength of the American forces that are being rapidly transported over-seas to strengthen the Allied lines. Despite their belittling of our own efforts in the war, it is now evident that the Germans realize our country is throwing all her strength to help the Allied cause; they are very wide awake to their own dangers as a consequence. And this brings up for consideration the all important question of reserves. The success of the Entente Allies will depend entirely upon their keeping out of the present fighting as many of their men as possible while forcing the Germans to use up their own reserves now.

There is no definite information as to the actual number of men available on either side of the present struggles on the western lines. But, according to the reports of the French and English General Staffs, the Germans used, in the great battles beginning March 21st in front of Cambrai and Amiens, as also in the Ypres sector, 144 divisions of the 280 actually available on the western front. This would mean about one million seven hundred and twenty thousand men that have actually been on the firing lines. Some of these divisions suffered so severely that they had to be withdrawn for rest and reorganization. In the most recent fighting around Ypres, it is reported that twenty-five or six fresh divisions have been employed. If true, this would leave only 38 divisions that have not so far been used. In this battle, as in every other great one, the time must come when one side or the other must make its final effort, in other words must use its main strength at one place. So far the allied generalissimo has shown wonderful ability in warding off the enemy's blows at various places, even though at times the latter has massed as many as twelve thousand men on a mile front, with the support of the heaviest artillery and of quantities of

machine guns and trench mortars. The progress of the present struggle will no doubt make the enemy strike his final blow at some point; and, if he loses, his game is up and the war is lost.

Recently good fortune appears to have deserted the Germans as weather conditions have been unusually bad and the whole country in the north has been converted almost into a morass, preventing troop movements and the bringing up of heavy guns and munitions. This has all been recognized by the allied troops as aiding in victory since it gives time for the American forces to come up and to strengthen the battle lines. Time is certainly now fighting against the Germans, for the German people are being subjected to a very disquieting and discouraging test. Many weeks have passed since the tremendous drive was started from the St. Quentin front; and so far no strategic decision of any moment is in sight. If nothing is gained in the next six or seven weeks that is comparable with the German effort, the German position in France and Belgium will be far worse than it would have been strategically had the deadlock on the front been indefinitely continued and had the last gigantic drive never been attempted. For Germany lost more men in her drive against the English front than she has ever lost in any long continued offensive since the beginning of the war; in the drive in the south in the vicinity of the Somme, the losses were estimated at three hundred thousand and, since that time, in the Ypres sector it is believed that two hundred thousand more can be added. These losses must be a terrible drain upon her available strength for it is generally



The battle front and the Channel ports

Arrows show regions in which the next German drive may occur recognized the present offensive has called for Germany's full strength and marks the greatest effort on either side since the beginning of the war.

The successful resistance so far made by the Entente Allies along the entire front guarantees almost to a certainty the safety of the Channel ports; even if, eventually, the Germans should reach the Channel coast, their losses would have been so great that they could reap no great gain from their success. It is certainly the opinion of all students of the war that the Allies would not give up the coast line without a strong counter-attack with all reserves; so far there is no evidence of an early move of this kind, which indicates that a strong defensive is still deemed as giving the best prospect of success. Such a defense gives time to bring up reinforcements in large numbers both from England and America, to restore all lines of communications that were so badly disrupted by the initial German drives, and to arrange and amplify all lines of defense as now occupied by the combined allied troops. When the Entente initiative in a forward move is once begun, the evident weakness in the present positions of the Germans should prove to the latter very costly in both men and material as well as in territory.

The latest reports indicate heavy artillery firing on the Somme front both north and south of that river. The main portion of the German reserves are said to be in the rear of this front; so that it is assumed the principal effort of the Germans will probably be there. But the gain of any particular position in the present struggle

counts for little. It is a question of staying power—that is, which side will first reach the end of its reserves or of its resources. So far every indication is that the Germans have found it necessary to throw in fresh divisions at various points and that they have had to use up very rapidly parts of their reserves. On the contrary it is said Italy has already contributed 250,000 men to the reserve army that General Foch has been building up behind the French lines; and this army is being constantly strengthened. If such an army can be formed, it will be a potent factor for success when the final blow falls. The advantage of mobile bodies of considerable size to reinforce at a critical time threatened breaks in lines was shown when the arrival of fresh French troops in Picardy closed the road to the Channel at Boulogne and Abbeville by way of Amiens; also when similar French reinforcements in Flanders aided in closing the roads to Dunkirk and Calais by way of Hazebrouck and Poperinghe. The use of such troops on the north and south fronts must have made heavy inroads upon Foch's reserves; therefore, it has taken time to make up the losses and to reestablish a suitable general reserve.

According to telegraphic advices the Austro-Germans are concentrating on the Italian front west of Lake Garda. The plan which they are endeavoring apparently to carry out is to make an invasion of Italy by way of the Trentino. This would outflank the left of the present Italian lines and would require a withdrawal behind the line of the Adige or farther west and would require the abandonment of Venice and Padua. It would mean the overrunning of the plains of Lombardy and Piedmont, which would take away from Italy her principal industrial centers; if entirely successful, it would also mean an attack upon the rear of the French lines by way of Italy. The positions and morale of the Italian armies at present are said to be good; so that the realization of the grandiose projects of the enemy may be indefinitely postponed by a strong and successful resistance. Up to the present only local engagements have taken place so far this year with few decided advantages to either side. A successful strategic assault by the Italians on Monte Corno has been noted; this mountain overlooks a portion of the Lagarina valley leading from Trent and Rovereto. The Italians have begun the summer campaign by a local attack.

In general, this must always be the case as the mountainous country at present occupied by the opposing forces does not lend itself to direct attacks on a large scale; at times, however, such attacks will enable assaults to be made on the flanks of other positions where retirements of an enemy must then be made. The chief object of the move against Monte Corno was to gain possession of a dominating height, overlooking the principal highway out of the mountains, thus giving the advantages of high positions with command of neighboring heights and approaches. So far the results of the assault on the hill have been most satisfactory as the latest information is all that all efforts of the Austrians to recapture the mountain have been successfully repulsed. A strong Austrian post has also been captured on the Col dell' Orso on the mountain front between the Brenta and Piave rivers. The capture of the mountain makes a salient in the Austrian lines in that portion of the front. The mountain lies three miles north of Monte Grappa and about the same distance to the northeast of Monte Tomba, against both of which the Austrians sacrificed large numbers in useless assaults last year.

But little except artillery engagements have occurred recently on the Balkan and Salonica fronts; some drives have been made by the allied forces—notably by Serbian troops; but no moves on a large scale have so far been attempted due very probably to unfavorable weather conditions that have prevented the bringing up of supplies and ammunition.

So much has been recently said and written about the battles raging on the western front that the importance and extent of operations in Palestine and Mesopotamia have been almost lost to public sight. After a long and careful preparation and organization the British troops are advancing along the main roads from Bagdad north in the direction of Mosul. The principal opposition experienced by them so far has been on the road through Kifri and Kerkuk along the foothills of the range of mountains that lies along the southwestern borders of Persia. This route, although some miles longer than the Tigris River road to Mosul, gives, from the character of the country, better opportunities for attack as well as for defense. As the distance along the Tigris from Bagdad to Mosul is about two hundred and twenty miles and by the route through the foothills is 265 miles, the fact that Kifri and Kerkuk have been captured shows that the British advance is at least seventy miles from Kerkuk and is the objective of the British drive in Mesopotamia. When this town is once occupied, the

(Concluded on page 488)



# Our Sky Army

What America Can Do to Win the War in the Air

By C. G. Grey, Editor of the Airplane, London, England

NEWSPAPER reports perpetrated on lines which remind one of the advertisements of a new pill, or of the booming of a cinema star, have given to American and British people alike—except to those who are on the inside of things—the impression that all America has to do to win the war is to send over to Europe a vast number of airplanes, drive the Germans out of the air, bomb their cities into a state of ruination, and dictate peace in Berlin. In fact these same glowing reports distinctly convey the idea that this very desirable line of action is actually well on the way to being in full blast.

It seems well, therefore, to point out, from some little knowledge of aviation acquired by living entirely among aeronautical affairs for the past nine years, that winning the war in the air is not quite so simple a business as it seems. When Russia went into the war, thanks to graft and mismanagement, many thousands of her fighting men were armed only with clubs and pikes, and they were slaughtered in thousands. They were merely what the Germans called "cannon-fodder." At a certain period on the Western Front, owing to technical misjudgment in England, the British Royal Flying Corps was supplied with quantities of slow low-flying aeroplanes which were completely at the mercy of the German Fokker monoplanes whenever they crossed the lines, and the men and machines became known in bitter jest among the rest of the Corps as "Fokker-fodder." Any error of judgment in the supply of airplanes may easily result in merely supplying more "fodder" for German guns and "chaser" airplanes.

To the ordinary man who knows nothing of aviation, an airplane is just an airplane, much as to any child from Detroit, Mich., any horse is just a horse because he sees nothing but automobiles. In reality there is quite as much difference between one type or make of airplane and another as there is between one breed of horse and another. One does not expect a thoroughbred, and a trotting horse and a dray-horse all to do the same kind of work; therefore, one must not expect all airplanes to be equally suited for all jobs.

There are roughly three types of airplanes: A. The high-speed fighting machine is generally a single seater

and never more than a two seater. It is frequently erroneously called a "scout," though it does no scouting. Its speed at 10,000 feet above sea level must be at least 120 miles an hour, otherwise it cannot catch its enemy, and it should reach as nearly as possible 150 miles an hour. It must be very quick in maneuvering in every direction, otherwise it cannot attack a nimble enemy. It must be able to reach a height of at least 18,000 feet, otherwise it cannot climb after a slow but powerful enemy, and it should be able to reach 23,000 feet. Its horse-power should be at least 200.

B. The reconnaissance machine is always a two-seater and occasionally a three-seater. It has to do photography work. It has to do artillery observation. In addition to the crew it has to carry radio-telegraph apparatus, machine-guns for self-defense, and probably small bombs. Its speed must be not less than 110 miles an hour, otherwise it cannot hope to escape pursuit, and it should be able to do 140 miles an hour. It must reach a height of at least 15,000 feet, to escape anti-aircraft gun-fire, and it ought to reach 20,000 feet or more, when it has expended its bombs and ammunition, and most of its fuel. Also it must be reasonably quick to maneuver. It should have at least 300 horse-power.

C. The bombing machines. These are of two types. C. 1. The day bomber. Very similar to the reconnaissance machine, but without radio-apparatus or photographic apparatus, so that it may carry a bigger weight of bombs and fuel for longer journeys over enemy country.

C. 2. The night bomber. A big machine with two or more engines. It should do at least 100 miles an hour, and be capable of carrying at least 1,500 pounds of bombs. Also, it should be capable of rising to over 20,000 feet when rid of its bombs, so that it may have a chance of getting home unobserved in daylight. It may have five or six engines, totalling perhaps, 2,000 horse-power—the Germans have them already—and this type should be able to carry fuel for eight hours flying with probably 5,000 pounds of bombs.

Now each one of these types of airplanes needs a different type of pilot and passenger. The type A pilot

need only be a clever flier and a good shot. The type B pilot and his observer-passenger need to be thoroughly trained soldiers, with exact knowledge of the significance of all movements of troops, railway trains, wagon-trains, and so forth which they see in the course of their journey. The type C 1 pilot has to have much skill and judgment as a pilot, a navigator and a bomb dropper, and his passenger has to be a skilful machine gunner. The type C 2 pilot also needs great skill as a navigator, but less as a bomb-dropper, for marks cannot be identified at night.

Each type needs a different kind of nerve. The fighter needs dash and blood-thirstiness. The reconnaissance pilot needs calm determination and cool judgment as to when to fight to obtain information and when to run away after he has got it. The bombers need dogged pluck and grit, with determination to get to their objectives at all cost.

Taking these premises, it is easy to see that the type B machine with all its complications and the type B pilot with all his special qualifications and training take more time to produce than either type A or type C.

The type A machine, being small, can be built quickly in great numbers, on a quick production basis. The type A pilot has only to learn to fly and fight. They are the quickest of all to produce, and the most suited to American men and methods.

The type C Machine, especially the C 2 type, being big and strong, needs little fine workmanship, and can be built quickly, in spite of its size, by comparatively inexperienced hands, and without any special machinery. The type C Pilot can also be produced quickly, for he only has to learn navigation and bombing, without the science of soldiering. The grit and determination required of him are particularly prevalent in America.

Now, Britain and France have specialized largely on training men for reconnaissance, photography and artillery observation. Vast numbers are in training and vast organizations exist for training more. But bombing is becoming recognized as a more and more important feature in the war, and more and more bombers are wanted.

(Concluded on page 488)

## Correspondence

The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.

### Airplane Design

To the Editor of the SCIENTIFIC AMERICAN:

Recent developments in the "staggered" arrangement of aerofoils and the use of pointed or tapered wings calls to the writer some pioneer work which he performed in collaboration with the late Octave Chanute.

A general research and consideration of airplane design resulted in my constructing in 1908 a glider which will stand consideration as the prototype of all staggered

modified biplane type, the upper plane staggered forward and the two tapered wings brought together at their tips to minimize inter-plane struts as in the "Ago." The rear main spar of the upper wing and the front spar of the lower wing met at their extremities and were bowed apart at the center. The front spar of the upper wing was curved when viewed from above and its tips bent around to meet the other spars at each end. The rear main spar of the lower plane was curved in somewhat the same manner but extended to the rear. The disposition of the ribs on this arrangement provided a considerable degree of wing flexibility.

It was reasoned correctly that the decreasing gap between the planes if their tips were brought together would be compensated by tapering the wings.

L. J. LESH.

New York City.

### The Castor Bean

To the Editor of the SCIENTIFIC AMERICAN:

In all probability there will be an enormous crop of castor oil beans produced this year in response to the urgent demand of the government.

The oil of course, is the primary object for it is said to be necessary for lubricating air motors.

After the oil is extracted there remains vast quantities of pulp or cake apparently of no value whatever.

Now, in all parts of the plant Ricini, root, stalk, leaves and fruit there is one or more alkaloids or active principles, that are very poisonous and destructive to all animal life, insects, bugs, beetles, grubs, etc.

Why not have this subject studied scientifically for the best method of extracting this active principle and the best way of preparing it on a practical and commercial scale for general use as an insect destroyer? The supply of the raw material is abundant, or will be ready to hand this fall.

Would not the Germans work this out and make a great success of it? It could be used either as a dust or as a soluble spray. It should exterminate the potato bug, the bollweevil, the scale, the rosebud mite and grubs and worms generally.

If properly worked out, and with improved apparatus for applying it this thing should be worth a small fortune to some one; besides being of inestimable benefit to mankind. I should think that some of our Universities with their ample laboratory facilities would do well to take this matter up at once and work it out thoroughly.

There are perhaps two or more poisons obtainable from this abundant source, one volatile, the other soluble, as is well known in a 10 per cent salt solution. Or the dried pulp could be made into a fine powder and used that way. My attention was called to this some years ago in this way: My back lot was infested with ground moles and also with cut worms. I planted Ricini Zangaberis around the lot. The moles quit the place cold, and also the worms, etc. I noticed also that no bug, insect or any living thing would molest it.

J. A. BISHOP.

San Antonio, Texas.

### Bridges a Prerequisite for Roads

To the Editor of the SCIENTIFIC AMERICAN:

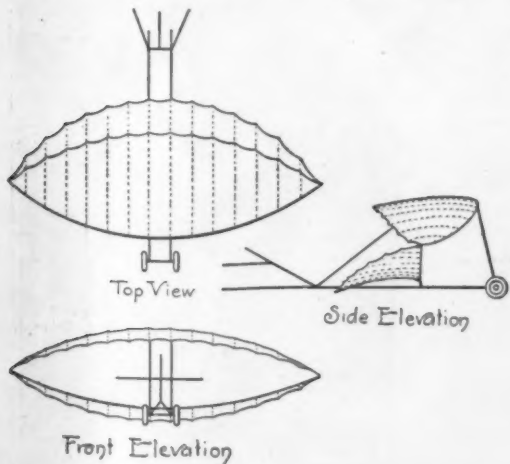
I have been very much interested in the good roads problem, which the SCIENTIFIC AMERICAN is so strongly advocating. It goes without saying that improved roads become the more important with the growing use of motor driven vehicles. Along with improved roads there is need to be included in the system the construction of bridges across streams. Especially are these necessary where improved roads are continuous between states with rivers as dividing lines. How deficient we are, generally, in bridges I am unable to say. Take for instance this part of the Middle West and consider that there is not a single wagon bridge (such as required by motor vehicles), across, either the Ohio or Mississippi Rivers between Louisville, Ky. and Memphis Tenn. Nor is there such a bridge across the Wabash River below Vincennes, Ind. These rivers are apt to be closed to navigation, or crossings by ferries due to ice freshets or other causes, from one to three months during the year, thus leaving for a time, a vast and important territory blocked against interstate transportation, otherwise than by railroads. It is unnecessary to state that with suitable bridges, crossings could be made at both day and night, and at all times of the year.

Probably no better example of the value of good roads presents itself than in France where, for instance, the government, at the beginning of the war was enabled to transport quickly by motor cars sufficient troops and munitions to repel the early German onrush towards Paris.

No one can foretell how soon we may be confronted with conditions that will require increased transportation.

HOMER LICHTENBERGER.

New Harmony, Ind.



plane machines now in use, as a remote ancestor of the tapered wing "Ago" fighter used by the Germans and as the first expression of another constructional feature which has not yet come into general use.

This machine which flew with considerable success at Morris Park, N. Y., at the first meeting of the Aeronautical Society and was destroyed with some damage to the aviator on its last flight, in a high wind, was of a



# Surgery in the Navy

U. S. S. "Mercy" the Latest Development of the Hospital Ship

**M**ORE and more, of recent years, the hospital ship has come to be an integral part of the armed force of a belligerent. We in the United States need go no farther back than 1898 to recall the day when an intelligently designed floating hospital was more or less of a novelty, but today it is accepted practice. Not only are the wounded evacuated from the military hospitals of France largely by this means, but the traditional sick-bay of the man-of-war has now become merely a place for trivial ailments, and a first aid station where wounds and severe illness can be looked after pending transfer. The hospital ship is today a fundamental feature of warfare by sea—as much so as is the hospital itself a fundamental part of civil or military existence ashore.

Nor has the science or art of constructing and equipping the floating hospital been at a standstill of late years. The visitor to the latest hospital ship might well rub his eyes and convince himself with difficulty that he was not in one of the great city institutions of New York or Chicago or some other metropolis of the first rank. Every contribution that human ingenuity can contrive to assure the safety and comfort of the inmates is to be found aboard such a vessel.

Not, perhaps, the last word, but surely the latest, has been enunciated by the builders of the "Mercy" and the "Comfort," most recent of American hospital ships. It was aboard the "Mercy," already in active service, that the pictures on this page were taken; the "Comfort," a sister ship, is soon to go into commission. Both ships are intended to serve our navy and are among the most completely equipped vessels of their kind in the world.

The novel features of these craft begin at their first contact with the patient. Perhaps it has not occurred to the layman that, in the case of a hospital ship, the operation of taking on passengers is a delicate one. A sick or wounded man can hardly be thrown aboard like a sack of potatoes or a crate of machine parts; he must come over the side gently, right side up and on an even keel.

The form-fitting Stokes stretcher is the device which makes this possible. As our picture shows, this is a cross between a trundle bed and the wire tray in which

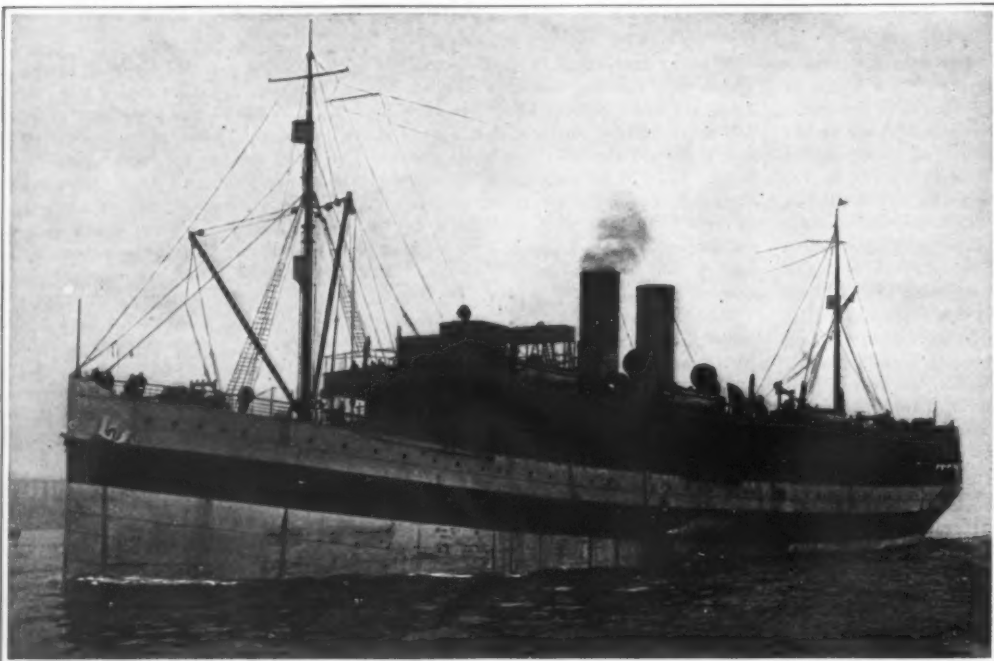
the careful housewife drains her dishes after washing. Into this tray, nicely shaped to the contours of the

ing; but with the X-ray one gets a real visual impression of what it is that is being done.

On board the "Mercy" the X-ray room is most completely equipped with the latest aids to radiography. Every up-to-date apparatus for taking shadowgraphs on screen or on plate is found here, with all the trigonometric accessories necessary for locating a piece of shell in the patient's anatomy. The arrangement whereby one reclines at ease on one's elbow above the photographic plate during the exposure is of course but one of the many techniques which the radiographer employs, according to the circumstances.

After the patient has been passed under the eyes of the members of the staff who decide what is the matter with him and what is to be done about it, he goes to his ward. In the severe and obvious cases which form so large a proportion of the actually wounded, he is then for the first time unpacked from the little wire tray in which he came aboard. Our picture shows this operation taking place; and perhaps the one impression one takes away from it above all others is that of the very clever utilization of the available bunk space to provide comfortable quarters for a maximum number of patients.

Perhaps the diagnosis called for an operation, immediate or eventual. In this event, we may be a trifle inclined to recall the well-known episode of fact and



Copyright, Paul Thompson

Our latest hospital ship leaving "an Atlantic port" for active service



Copyright, Paul Thompson

Bringing a patient aboard the hospital ship on the form-fitting stretcher

human back and sides, the wounded man is snugly packed; then, by means of a four-point suspension which keeps his head and his feet where they ought to be, he is



Copyright, Paul Thompson

Removal of shell fragment from the eye by magnet

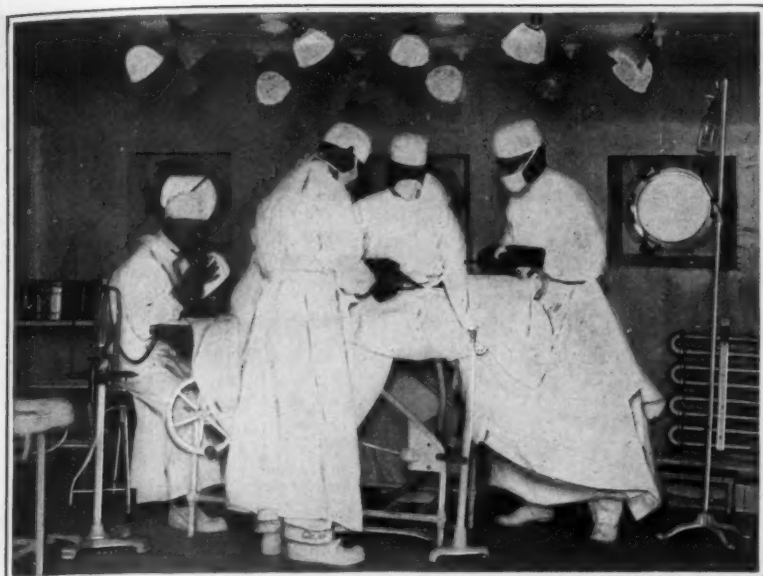


The experimental contingent of the ship's quota



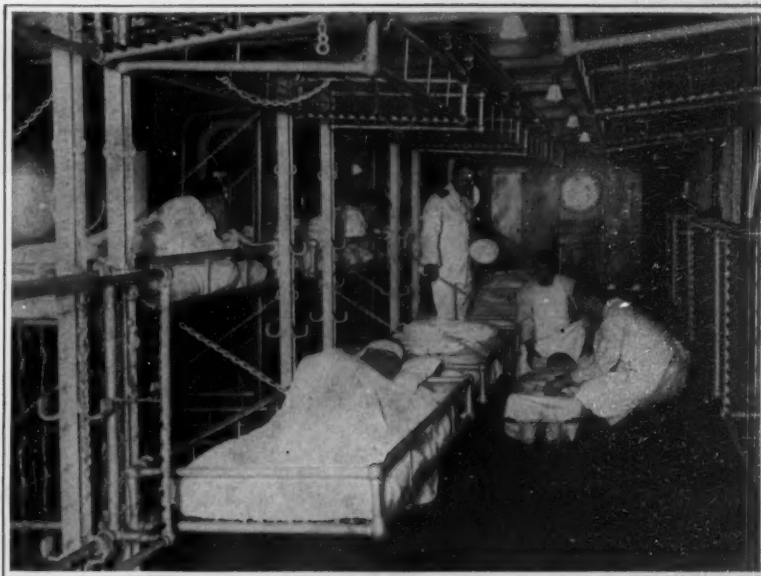
Making synthetic milk in the "mechanical cow"





Copyright, Paul Thompson

The operating room aboard the "Mercy"



Copyright, Paul Thompson

One of the large surgical wards

fiction, wherein the life of the stricken passenger on the great liner is saved by a hasty cutting open on the billiard table, engineered by the captain and the young medical student, working with tools borrowed from the kitchen and the ship's carpenter, and with no pretense at antiseptic conditions, let alone asepsis. On the "Mercy" we have nothing like this. The patient whose condition calls for an operation will sooner or later find himself on the big wheeled operating table, with a battery of electric lamps craning their long necks to illuminate him to the greatest effect for the benefit of the surgeons, and with all the other landmarks of an operating room in the finest hospital ashore. Indeed, if the ship will but refrain from rolling beneath us, we might easily watch an entire operation without ever realizing that we were not on dry land; there is not the slightest atmosphere of haste or improvisation, or even of the unusual, but rather one of complete preparedness and accustomedness.

The operating room is located forward of the ship and on the upper deck. Its equipment was donated to the last detail by the Colonial Dames of America.

No chances are taken that there may be anything the matter with the patient which the ship will not be equipped to handle. There is one room aboard the "Mercy" where an enlisted specialist in diseases of the eye, ears, nose and throat holds forth. When there is anything wrong with adenoids or tonsils or Eustachian tubes or any of the other delicate organs of the face and throat, the case comes to him. He is shown, in one of the pictures, applying one of the latest methods for the removal of shell splinters from the eye by use of an electro-magnet.

This specialist is reinforced, in another quarter of the ship, by a dentist. The navy prides itself on the condition of the

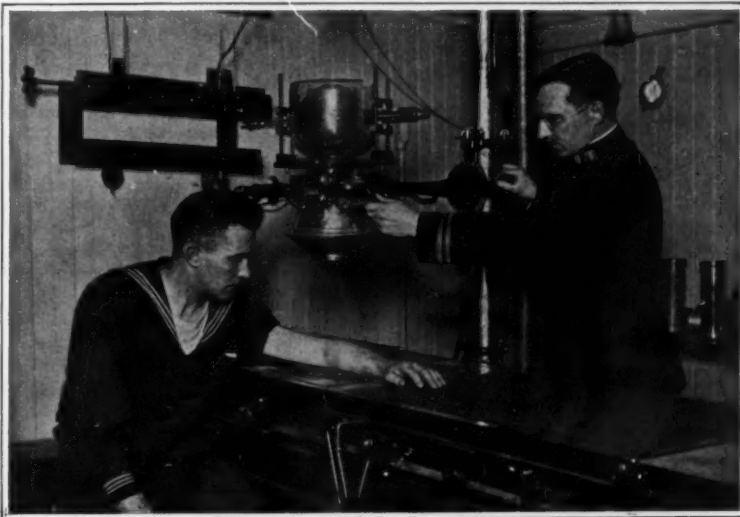
(Concluded on page 488)

### New Army Decorations and Medals

ON May 13th the House and Senate Military Committees received Secretary Baker's bill to be substituted for all the pending legislation which provides for the award of decorations and medals for heroic deeds or for other exceptional meritorious service to the government in connection with military operations. The "Medal of Honor" already exists and may, under the provisions of the bill, be presented by the President in the name of Congress to such officers and enlisted men who "in action involving actual conflict with an enemy distinguish themselves conspicuously by gallantry and intrepidity at the risk of life above and beyond the call of duty."

The Medal of Honor to be presented by the President takes the place of the Congressional medal of honor heretofore awarded only by Congressional act. This removes the chances for delay in the distribution of America's most signal military distinction. The Medal of Honor under the terms of its grant parallels the French *Croix de Guerre* "with palms." To win

the American medal of honor requires a deed of gallantry equivalent to that required to earn the Victoria Cross, the highest British distinction, but with the exception that the "V. C." is given only where the act is performed under the observation of the soldier's commanding officer.



Copyright, Paul Thompson

Taking an X-ray of a damaged arm on the hospital ship



The new United States Army decorations and medals



The animated lunch-counter of the front lines

The Distinguished Service Cross will be awarded by the President, but not in the name of Congress. They will go to any man or woman who while serving in any capacity in the army since the United States entered the present war "has distinguished or who shall hereafter distinguish himself or herself by extraordinary heroism in connection with military operations against an armed enemy."

The Distinguished Service Cross practically parallels the French *Croix de Guerre* of the ordinary class or the British Distinguished Service Order.

Of the first issue 100 of the Distinguished Service Crosses have been shipped to France. Our engraving shows the first and second design for the crosses. In the first, or provisional cross will be noted the oak leaves, which are wanting in the second issue. The eagle is the dominant feature in both styles as also in the Distinguished Service Medal which we also show.

Distinguished Service medals will be awarded to any person serving in any capacity in the army "who has or who shall hereafter distinguish himself or herself by exceptional meritorious service to the Government in a duty of great responsibility in time of war or in connection with military operations against an armed enemy." The Distinguished Service Medal has no exact parallel in the allied services. It is gratifying to note that the Army authorities have recognized the importance of having decorations and medals, and it is hoped that the Navy will soon provide similar and equivalent tokens for our Navy and the Marine Corps.

### Quick-Lunch Dog for Those in the Trenches

TRENCH warfare certainly interferes with the fighter's meals. After capturing the enemy's position in particular, is the fighter at a loss to know how he will get his regular rations; for no sooner does the enemy find himself dispossessed from his original trenches than he opens up with an intense barrage fire designed to prevent ammunition and food from reaching the new occupants.

The French army believes it has solved the problem of carrying food to men in isolated trenches, in its lunch dogs. Carrying light lunches and coffee, and even cartridges for the men in the first-line trenches when the combat is hot and protracted, these splendidly-trained dogs are more certain to get through barrages than men. Each dog is equipped with a sort of double bag, strapped tight over its body, and provided with numerous pockets for food, coffee cans, ammunition and other supplies.

It is at the military dog training grounds at Paris that dogs are prepared for this service. Not only are these four-legged couriers taught to avoid the enemy and beware of tricks, but also to crawl on their stomach in order to escape flying bullets. Special masks are provided for these dogs when they must pass through a poison gas area.



# World Markets for American Manufactures

Conducted by WILLIAM W. SNIFFIN

A department devoted to the extension of American trade in foreign lands

## Cotton Goods and Textile Machinery

THE recent meeting in New York city of the two cotton manufacturers' associations of the country and the Sixth National Textile Exhibition brings to the fore the enormous development in the United States of the cotton industry, both in raw cotton and manufactured goods and in the machinery used in the various phases of their production. The peculiarly advantageous position occupied by the United States, producing, as it does, some 65 per cent of the world's supply of raw cotton, and that of the best quality, too, makes the subject unusually interesting to Americans. Our more recently developed manufactured cotton goods industry possesses if anything, an even greater interest. Its growth in the last few years, and especially since the beginning of the war, has been enormous, as our export statistics demonstrate.

Secretary Daniels addressed one of the sessions of the associations, where some two thousand manufacturers were present, all of whom are said to operate mills in the southern states. He referred to the utilization of North Carolina's water power, by which a series of cotton manufacturing plants had been established across the states of North and South Carolina. In Georgia, too, at Columbus, a large cotton manufacturing mill has recently been erected at a cost of \$3,000,000 and in it has been installed machinery for producing 53 different weaves of cotton fabrics. The conversion of the water power of these southern states into electric energy and its transmission over many miles to the cotton manufacturing plants without loss of effectiveness constitutes the distinct development of a new economic factor in our national life. The Panama Canal is certain, moreover, to open up extensive markets for the cotton of the South and, with the enormous development of water power and the cheapness of labor, the new manufacturing industry will be greatly stimulated in that region.

The United States is today, moreover, by reason of its location, resources and transportation facilities, the largest manufacturing country in the world. O. P. Austin, the statistician of the National City Bank of New York City, addressing the cotton manufacturers' association, said in part, "Our manufactures turned out in 1914, the year of the latest census, aggregated \$24,000,000,000, or more than those of any other two countries of the world, and today the value of the manufactures produced under the stimulus of war demands and high prices aggregate, in stated value, approximately 50 per cent more than in 1914, or perhaps \$35,000,000,000 a year.

"When the war began we were supplying \$1,000,000,000 worth of the \$8,000,000,000 worth of manufactures entering international trade; today we are ourselves supplying \$4,000,000,000 worth, while the fact that the other great manufacturing countries have, meantime, been compelled to reduce or suspend their exports of manufactures, suggests that we are now supplying nearly or quite one-half of the manufactures entering international trade. Our exports of manufactures in 1917 were actually double those of Great Britain in value."

This increased productive power, however, leads to the conclusion that the home market will never again be adequate for all or nearly all of our manufactured goods. Our capacity for making fabrics will be greater than our demands and the value of developed foreign markets is evident. Along with increased internal production and transportation systems we are increasing our shipping and seaport facilities. In the readjustment of industry that is to come after the war, when munition factories and war industries lay off their excess workers, the factories equipped for the development of our future trade will provide the necessary work for these skilled artisans.

We shall still continue to be the world's leading producer of raw cotton. Our foreign trade in this commodity, which has grown to 5,947,165 bales valued at \$543,100,542 in 1916-1917—much increased in value, though actually showing a decrease in amount—was years ago recognized as the balance-wheel of our trade. The late James Stillman, the former president of the National City Bank of New York, is said to have remarked some ten to twelve years ago that the balance of trade in our favor was just about equivalent to the value of our exports of cotton. Our foreign trade in cotton goods, moreover, which has not exceeded five per cent of the international trade in these products, amounted in the year just before the war to \$50,000,000, its record up to that time, but in 1917 this comparatively new industry had increased to over \$150,000,000.

Opportunities abroad are not wanting for further increases in this line of goods. Our nearest neighbors

have long been our good customers. Just recently word came from our Vice-Consul at Kingston, Jamaica, that a good opportunity existed on that island for our piece goods, such as shirtings, sheetings, gingham, drills, ducks, denims, muslins, etc. The population of the island exceeds 800,000, and, though the purchasing power of the people is small, in the aggregate a large business can be done. In 1916, some \$1,600,000 worth of low and medium-priced cotton goods was imported and the United States supplied over half, as contrasted with less than \$400,000 worth in 1913. This is but one example of our foreign trade opportunities. Many others might be cited.

But besides fabrics, the textile exhibit served to bring the attention of the world to our highly developed manufacture of textile machinery. Among the machines exhibited there were new automatic devices, stopping apparatus and high speed features, all designed to reduce labor costs to the minimum. Some of these devices, it was stated, enable one operative to run as many as twenty-two looms, whereas a year or two ago it was regarded almost as a superhuman task for the most skilled to run eight looms. This wonderful increase in productive power is due to inventions that automatically put in new bobbins, or that stop the machine long enough for a contrivance to discharge a shuttle with a bobbin that has run out, and replace it with a new one. These two inventions were described as easily the most important developments of the past two years in the textile industry. High speed individual electric motors, which have recently been adopted, are another factor assisting the manufacturer to reach a maximum output.

The great opportunity of American manufacturers of textile machinery was described by the representative of a Boston concern engaged in their manufacture. "In England," he said, "from sixty to seventy per cent of the capacity of the plants of the textile machinery manufacturers has been taken over for the production of munitions. Northern France and Belgium, where textile machinery was manufactured, are in the hands of the Germans, who melted the machinery and literally fired it back at the former owners.

"It is hardly probable that the German machinery manufacturers are in much better condition to turn out products, even if the civilized world should prove willing to buy from them after the war ends. It, therefore, appears inevitable that, for the replacement of equipment in the mills of the devastated regions of France and Belgium and to meet the requirements of South America, Japan, China and India, American manufacturers must be appealed to."

New York was selected by these textile organizations as the world's center at this time for international trade and many orders were placed with American manufacturers by buyers from all parts of the world for large quantities of machinery, mill supplies, dyestuffs and fabrics. They are said to have reached the total of \$15,000,000.

## Opportunities for American Jewelry in Cuba

AMERICAN jewelry manufacturers have a good opportunity at present to extend their export trade in Cuba. They possess two great advantages over their European competitors—their proximity to the market, since goods reach Havana in about three days after leaving New York city, and the lower duties paid on American goods. These reductions are substantial, amounting on articles made of gold, silver and platinum to 20 per cent, on gold-plated and silver-plated goods, to 30 per cent, and on American watches, to 40 per cent.

The American manufacturer must not get the impression that he can sell to the Cuban jeweler any kind of goods at any price. The local jeweler knows values, and has received a thorough training in buying from all the markets of the world. Moreover, the tastes of this market are decidedly different from those of the United States. They are European, which in most cases means making up special goods. The Cuban market, however, is of sufficient importance in many articles to warrant this. To the American manufacturer who seriously contemplates entering the export field with the idea of building up a permanent trade the island offers an excellent market, which should prove profitable to him if he spends the time and the money to cater to it properly.

There are several ways of selling in Cuba, but the best one, according to S. W. Rosenthal, a special agent of the U. S. Bureau of Foreign and Domestic Commerce, who was sent to Latin-American countries to study their possibilities as export markets for American jewelry, is to send a salesman with a complete line of samples, either to cover the territory himself or to appoint a capable local representative. While the language of the country is Spanish, several important merchants speak

English also. There are many substantial firms in the jewelry line, some of which have been established for about forty years and have a capital of more than \$100,000.

## Trade with Switzerland Resumed

THE United States War Trade Board and the Government of Switzerland recently reached an agreement whereby export shipments for which licenses are granted will again be sent forward to Switzerland. The chief difficulty at present consists in securing ocean shipping space to move the freight already waiting clearance at New York. Tonnage for Marseilles and Cote in France, the ports by which imports to Switzerland are usually sent, is in great demand for the shipment of articles more or less connected with the war needs of the French government.

According to the arrangements made with the Swiss officials, the proper procedure to observe in making these shipments is as follows: The buyer in Switzerland must first apply to the Société Suisse de Surveillance Economique (otherwise known briefly as the "S.S.S.") with headquarters in Berne. If this organization, to which all goods for Switzerland must be consigned, approves the consignment to it of the proposed imports, the prospective shipment is given a number and the importer is notified of it. A detailed report of the shipment is also sent to the Swiss Legation in Washington, D. C.

The shipper will be informed of this step by the importer and will then submit to the Swiss Legation in Washington an application for an export license on the regular form provided by the War Trade Board. This paper should be accompanied by a letter giving the name of the consignee, the nature and quantity of the goods, and the "S. S. S." number. It is also desirable to include any special reasons why the license should be granted, inasmuch as this additional information will be taken into consideration by the Legation. Here the application will be checked against information received from the Swiss authorities and if satisfactory will be endorsed and forwarded to the War Trade Board. If granted by the Board, the license is returned to the Legation, which in turn notifies the applicant and delivers the license to him or his shipping agents, if so instructed. Likewise, in case of refusal by the War Trade Board, the Legation and the applicant are both notified. The Swiss authorities retain the license until they receive definite information from the shipper regarding the steamer on which the goods are to be forwarded. If the shipment is to clear from the port of New York, it is desirable to inform the Legation to this effect in the letter accompanying the application. In this case the license is referred to the Swiss Consulate in New York and held there pending the final arrangements for shipping.

The movement of trade between Switzerland and the United States for the first 11 months of the years 1915, 1916 and 1917, has been as follows: Imports into Switzerland from the United States, \$17,985,743, \$20,486,455, and \$18,008,416, respectively; and exports to the United States, \$4,808,626, \$12,027,041 and \$17,920,409, respectively. Thus, the Swiss trade has been far from a negligible factor in the commerce of the United States and the arrangement of the compact with the European republic will be a source of satisfaction to many American exporters. Similar trade compacts have also been reached with Sweden, Finland, Denmark, and Holland and as we go to press negotiations are pending with Norway and Spain to the same end.

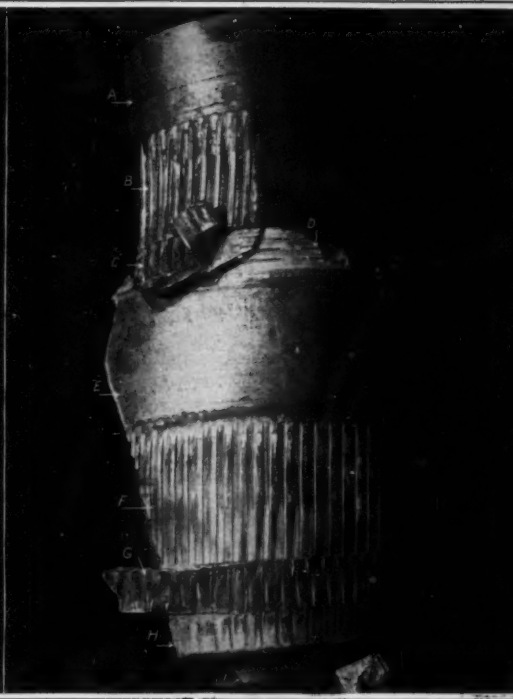
## American Banking Facilities Abroad

THE increase in the number of branches of American banks in other countries is an interesting phase in the expansion of our foreign trade. There are now many American banks in Europe, South America and Asia. Banks are located in the following cities among others: London, Copenhagen, Petrograd, Moscow, Milan, Genoa, Havana, Santiago de Cuba, Santo Domingo, Santiago de los Caballeros, San Pedro de Macoris, Puerto Plata, Panama City, Colon, Medellin, Caracas, Valparaiso, Bahia, Rio de Janeiro, Sao Paulo, Montevideo, Buenos Aires, Kobe, Yokohama, Peking, Tientsin, Shanghai, Hankow, Canton, Hongkong, Manila, Cebu, Singapore, Batavia, Calcutta and Bombay. At this time, when the unavoidable interference of war with ocean transportation, established sources of supply of foreign new materials and normal methods of banking and exchange make direct foreign banking connections through American institutions of exceptional service, the spread of these branch banks throughout the world will be of great assistance to American manufacturers in both export and import activities.





This fragment shows clearly that rifling is machined into the shell



Two fragments showing the two separate rifling bands



Interior view of base of shell showing seating for fuse plug

## Some Further Particulars of the Seventy-Five-Mile Shell

### Rifling the Shell as well as the Gun

THE recovery of additional fragments of the shells which have been reaching Paris from behind the German lines, makes it possible to produce a drawing which shows the shell with a close degree of accuracy.

There has been some discussion as to whether the curious parallel lines, scored deeply into the outer surface of the shell, were rifling that had been machined into the shell in the shops, or were merely the result of an upsetting of the wall of the shell forcing it against the rifling and causing it to become deeply scored. This effect has been observed in shrapnel whose walls have been made too thin, and it is a defect against which the inspectors at the proving grounds watch with very close attention. The upsetting, of course, is due to the inertia of the shell and its charge, causing the walls to bulge and bear heavily against the rifling.

The group of three photographs showing two unusually large fragments of the shell, and the other group showing some smaller fragments, tell their own story. The first group establishes beyond any doubt that the shells are formed with two separate sets of rifling, each with its own copper band behind it. The center photograph of the three gives us a view of the shell proper for its full length exclusive of the false nose or windshield. At A and E, the shell has been turned down to a diameter slightly less than the base of the rifling in order to allow the grooves and lands on the shell to engage freely those in the bore of the gun. At B is the forward rifling, and below it is shown, at D, the face of the groove, and at C, a portion of the rifling band. At D will be noticed a series of interrupted raised ribs, whose purpose is to prevent the band from slipping, either circumferentially or in the direction of the axis of the shell. At F is a section of rifling, somewhat longer than the forward portion; below this is the second rifling band G, and below that, the base of the shell H and J.

Now, referring to the group of smaller fragments, which shows three views of each piece, we have at the left a fragment of the wall of the shell, then the fuse plug at the base of the shell, and next the central diaphragm with a raised boss at the center, threaded to take the second fuse plug which is seen in place. This diaphragm is threaded on its periphery, and perforated. To the right is a fragment of the windshield at the nose of the shell.

A study of this material suggests that the Germans have had some trouble in securing the proper de-

tonation of the shell; and second, in obtaining the enormous velocity of rotation which is necessary in a flight whose duration is about three minutes. Why two fuses should be necessary is puzzling, unless indeed the shell-filler has had to be made so inert against shock as to call for such provision. This, however, is not all probable, and it seems to us that the two fuses are used merely to make it doubly certain that the shell will be exploded—if one fuse should fail to function the probabilities are that the other would. The detonation of the whole charge is made certain by the holes in the diaphragm through which, of course, the flame of explosion would pass to the other chamber.

It will be remembered that, in a previous article, we stated that the speed of rotation of projectiles may vary all the way from four thousand to twenty thousand per minute, depending upon the caliber. In the experimental work which the Germans must have done to secure a reliable gun, these fragments seem to show that they had trouble with the copper rifling bands; for nothing less than this would have caused them to return to the long-abandoned practice of providing rifling or studs, or other equivalent, on the face of the shell itself. Evidently, they found that the copper did not provide sufficient resistance to withstand the shearing and stripping effects of the inertia of the shell against rotation. The fact that the scoring on the band does not register with the rifling on the shell, suggests that the former slipped in the groove; although it is possible that this movement may have been caused by atmospheric resistance after the shell left the gun.

The provision of an additional rifling band toward the head of the shell is something novel. At an earlier period in the development of ordnance, a band was

placed at this point, but its function was to act merely as a centering or bearing band to maintain the shell in its true axial position in the bore. In this case, however, the Germans have used it as a rifling band and additional gas check. It would serve as a check for such gases as may have forced their way past the rifling band at the base.

In summing up, it must be admitted that in this new venture the Germans have contributed more to the entertainment of the public and the awakening of curious interest of technical men than they have to the science of ballistics and the art of gun construction and they have done this at the cost of drawing up another eternal indictment against themselves as a people unimaginably ruthless and cruel in their treatment of the civilian population.

### A Way to Find the Dirt

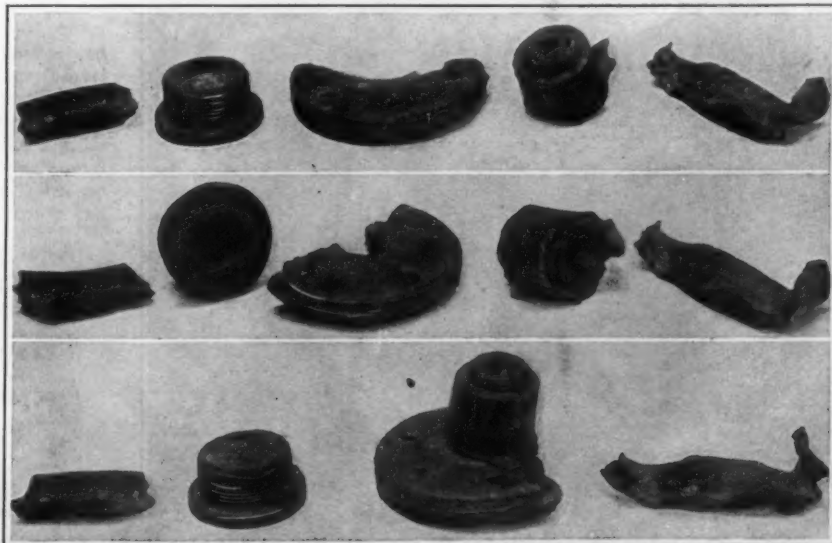
ONE of the essentials of a modern factory is sanitation and the leading manufacturers of this country have reached the conclusion that the chief aid to sanitation is the liberal use of paint. The prevailing idea of a decade ago that the best way to get rid of dirt was to sweep it into a dark corner has given place to the belief that all dark parts of the factory interior should be painted a light gray or white.

This method allows the dust and scraps to be easily seen against a white background and the sweepers in their daily round of the factory are less likely to skip the dark corners. As a result of this use of paint the appearance of factory interiors has been considerably improved and the health of the workers has been likewise bettered due to absence of disease-breeding germs.

The presence of these germs or bacteria, as the scientist

terms them, is the real danger resulting from the accumulation of dirt. Although, of course, the presence of dirt in corners detracts from the cleanliness and appearance, the vital consideration is the possibility of contagion among the employees resulting from the growth and propagation of disease-carrying bacteria which live in the dirt.

With the end in view of removing the dirt and bacteria, factory owners and superintendents have made the painting of all corners and dark places of the building compulsory at regular intervals. The result obtained in better sanitation has amply paid for the expenditure for paint materials and labor, besides the painted walls add more light.

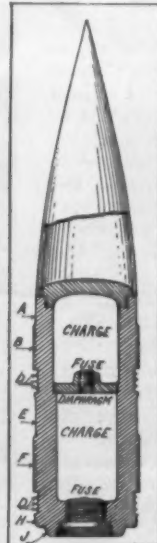


Fragment of wall of shell

Fuse plug at base of shell

Central diaphragm and second fuse plug

Fragment of the windshield at nose



Shell as shown by fragments



## Inventions New and Interesting

*A Department Devoted to Pioneer Work in the Arts*



Picnicking de luxe with the aid of a nickel meter

### Five Cents a Light

THE quarter meter for apartment dwellers is an old friend, and now we have a nickel meter too. In the city park at Redlands, Cal., the picnickers bring their lunch baskets and a coffee pot, but are not allowed to build a camp fire. In one corner of the park the local gas company has therefore installed a gas range, on a little table in an arbor protected from the wind.

Beside the range is a specially designed slot meter. The picniker drops a nickel in the slot, starting a clock-work mechanism which causes the gas to flow through the meter to the range. The gas may then be turned on at the range and used in the regulation manner for a period of five minutes. The device has proved to be a popular one, as well as a profitable one for the gas company.

### Car Conservation

IF the man who makes two blades of grass grow where but one grew before deserves credit for it, the man who can make freight cars double their capacity in these times of shortage of railway equipment may merit some meed of praise. It has been the custom to ship automobiles set end to end in the normal running position, with their greatest length parallel to the floor of the freight car. This was extremely wasteful of space and the cost of shipment was disproportionate, since the carrying capacity of the car, as measured in terms of more compact freight, was not half used. When a car shortage made more efficient use of space necessary many automobiles were left without freight transportation at all and could be delivered to their destinations only by sending chauffeurs to drive them overland, often through mud or during the deep snow and bitter cold of winter. This method involved a heavy man-cost; and, too, an automobile driven some hundreds of miles in bad weather can hardly be considered a "new" car when it arrives.

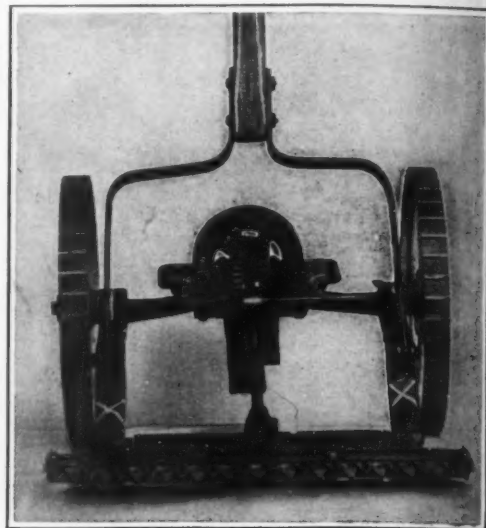
The architect of automobile manufacturers has worked out a nice problem for his company and it is being used to load four automobiles where but two could be placed before. He virtually cuts the length of each in half by running it up an inclined platform, specially designed, and mounting it upon a strong framework made to hold it so tilted and without injury during transit. The accompanying photograph shows the first of a quartette of autos set up and covered from harm by weather. The second car is being taken up the loading platform under its own power, the first section of the runway having been already removed, after serving its purpose. Each auto, in turn, will partially overlap its predecessor. Assuming that none of the wooden framework ever returns to the shipping point, the cost of this loading method is about \$15 per auto. This contingency is more than compensated by the doubled capacity of the freight car.

### The Front-Cut Lawn Mower

ONE Charles T. Bishop is the inventor of a front-cut lawn mower which he claims to surpass anything of the kind heretofore devised. This machine cuts a swath of 18 inches. The drive wheels are 12 inches high, set on axle with clutch and spring. The gear consists of two wheels and pinion, which operate a cutter-shaft carrying a double cam, in which two arms are attached. These arms are connected to blades, which give them an oscillating motion. These blades are so constructed as to form a complete shear-cut; and they are ground in such a manner as to let them lie flat together. Their edges are protected as a pair of scissors, and are held together by stud bolts, set in a cutter-bar. A flywheel is also provided that distributes the power of resistance equally to every part of the machine.

Here are some of the advantages that the inventor claims for his lawn mower over other makes. It will not only cut grass as short as any other machine, but it will also cut grass and weeds of any height, which circular-cutting machines will not do. In fact it will cut grass and weeds from the ground up. It does not injure grass by breaking or bruising it over a cutter-bar, as other machines do. It simply cuts the grass off standing straight up. It will cut close to trees, fences, curbing, shrubbery or any other object usually found about a lawn, flower garden or cemetery; and it will do this work well and without injury to either the object or the machines.

In action the two bars at the front of the machine oscillate across the carriage of the machine, playing on one another longitudinally so that the little cutters with which they are armed give a perfect scissors effect.



The lawn mower that cuts with a shear action

### Where a Six-Foot Pole Replaces a Switch Engine

ONE way to shunt cars back and forth among the switches and platforms of a freight yard or a factory siding is to send for a switch-engine and wait till it comes. A better way is to use the little device which we picture. Not only is a vast amount of time thus saved in the yards, but a good deal of expensive switch-engine operation is eliminated and the equipment turned to better use.

The lever and stand by means of which one man can jog the heaviest car along a few inches at a time until he gets it where he wants it almost explain themselves from the picture. Worthy of note are the muscle saving provision for wheeling it along the tracks, and the fact that it is canted outward at an angle sufficient to give the hand end a complete clearance of the tracks. This makes it possible to move a car even when it is in immediate proximity with another, as in uncoupling and breaking up a train.

### Not All Inventions Are Patentable

SOME of the most original ideas, involving creative effort of the highest order, and of inestimable benefits to mankind, may not receive the protection of the patent laws. Patent monopoly, while conferred as a reward for effort in a very large field, particularly industrial, is not universal in its application. The most noted case is that of the discovery of anesthesia, the court denying to the creator of this supremely beneficial process for the alleviation of suffering the right of patentable protection.

The noted attorney, Samuel Untermyer, in an argument recently before the Supreme Court of the United States, emphasized this limitation in the following words:

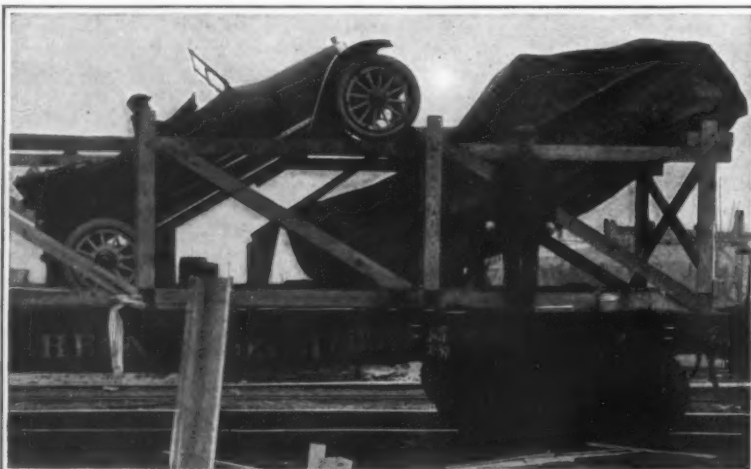
"Both the parties are in the position, with respect to news that has been published, of the man with an unpatentable idea or trade secret that has cost him years of labor and vast sums of money to develop; or of the architect who has created a beautiful structure, or the landscape gardener who has laid out a novel garden, or of any one of the many inventions in beauty, usefulness and science that are not patentable. So long as he keeps these things to himself he will be protected against their surreptitious taking. When he releases them they belong to the public."

### Changes in the Patent Office

MR. WM. F. WOOLARD, Chief Clerk of the Patent Office since 1908, has been assigned to take charge of Examining Division 21; Mr. A. H. Giles has been transferred from that Division to Division 45; and Mr. L. D. Underwood, in recent charge of the last named Division has taken the position of Law Examiner, made vacant by the transfer of Mr. M. H. Coulston to the position of Chief Clerk.

Mr. Woolard has filled his place with conspicuous ability, responding to the intricate and complex demands upon his re-

(Concluded on page 488)



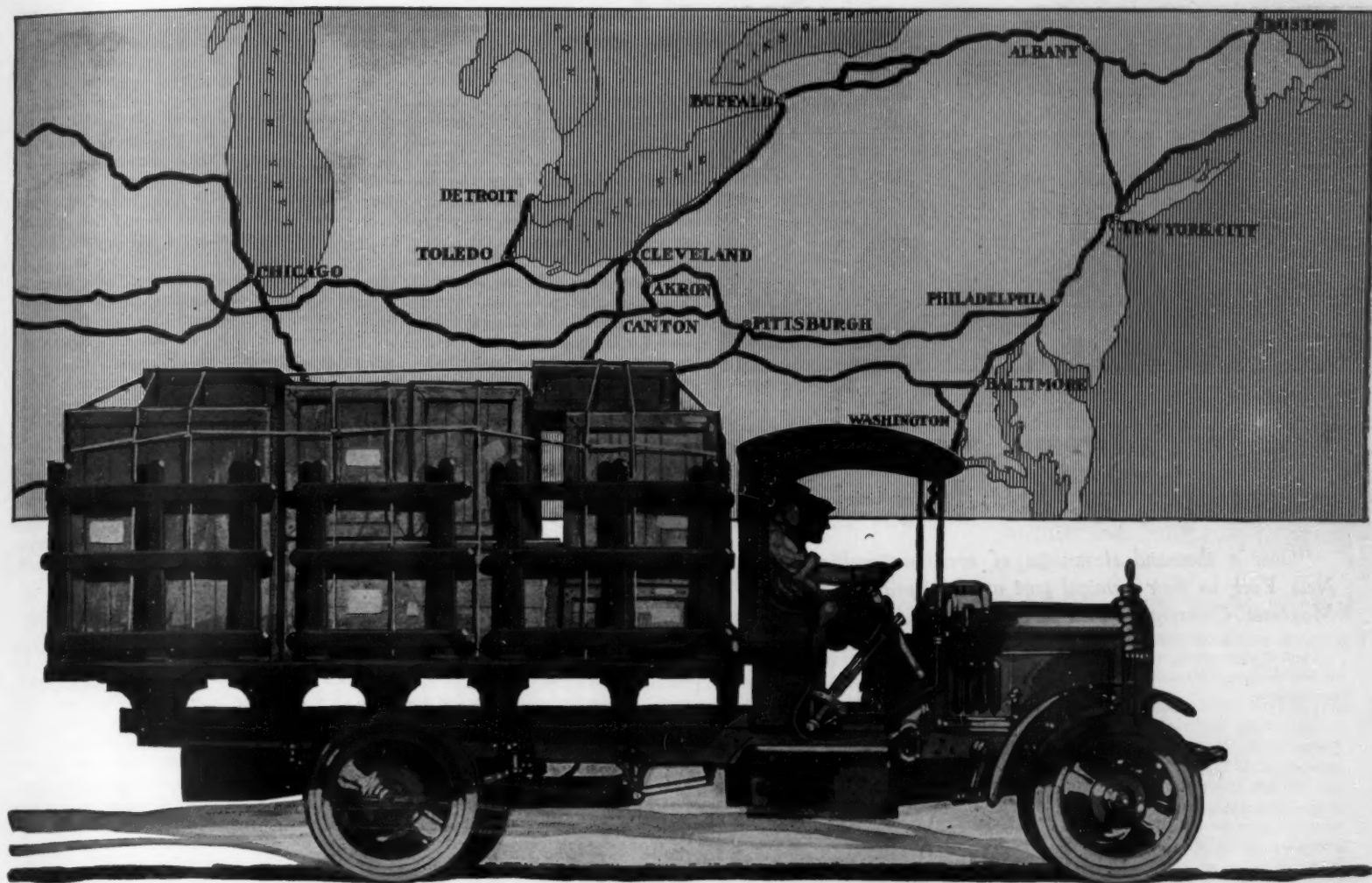
The latest wrinkle in shipping automobiles, which doubles the capacity of the cars

This machine, with its oscillating blades, can be used wherever it is desired to grow grass; and the blades are so constructed that they will hold edge and keep sharp much longer than other designs, and reasonably so, as they pass backward and forward over each other in the same manner as a pair of shears or scissors. The construction of a lawn mower that gets away from the rotary cut is on every ground a decided novelty.



Shunting freight cars without an engine





## Ten Thousand Miles—Ten Thousand Pounds One Ten Thousandth of an Inch

Long haul or short haul, over country roads or city streets, Timken Roller Bearings carry 10,000 pounds 10,000 miles with so little wear on the bearings that only delicate measuring instruments can detect it.

And this "One ten-thousandth of an inch" of wear has not in any way altered the operating principle of the bearing. By a part turn of an adjusting nut all the parts can be brought back into exactly the same relation as when the bearing was new.

Thus the 10,000 miles is wiped off the record and you start the truck out again with wheels running true and every shaft and gear in perfect alignment—tuned up to another 5,000 or 10,000 miles of service.

And the same process can be repeated again and again as long as the truck is in use.

This great Timken principle of take-up for wear is supplemented by every

other qualification for the hardest kind of service.

Timken Bearings are built in the Timken plant from the steel up. Timken is the only bearing manufacturer making his own steel.

Timken Bearings are made with such accuracy that the rollers in any bearing do not differ from one another by so much as one ten-thousandth of an inch in diameter.

The cups, cones and rollers of Timken Bearings are carbonized and heat-treated under rigid technical control by special Timken processes, so that

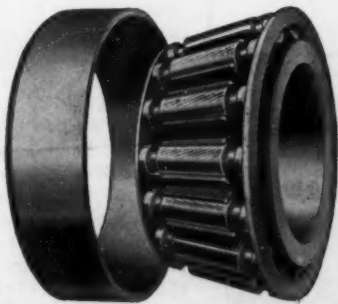
with a hard outer surface they have a tough, resilient core.

Timken engineering has produced in the tapered design of these bearings the one thoroughly successful method of providing take-up for wear and at the same time meeting both radial load and end thrust in one bearing. But Timken engineering goes much farther than this; it follows the bearing all the way through to its actual installation. The utmost care is used in selecting exactly the right size of bearing with just the right taper, for each place in each truck where it is to be used. The same careful insistence is laid upon correct mounting of the bearings in their place, so that none of the accuracy of manufacture may be lost by less careful handling in installation.

How well truck builders appreciate both Timken quality and Timken engineering co-operation is evidenced by the extent to which they use Timken Bearings.

This you will find stated in detail in the booklet, "The Companies Timken Keeps," sent free, postpaid, on request to

THE TIMKEN ROLLER BEARING CO.  
Canton, Ohio



# TIMKEN BEARINGS

FOR MOTOR CAR, TRUCK & TRACTOR





© Underhill, New York

## New York's Ocean Gateway is kept open by "85% Magnesia"—

*"Over a thousand steamships of every nationality using New York as their terminal port are equipped with '85% Magnesia' Coverings on their pipes and boilers."*

That statement is made by one of the largest contractors for this equipment.

The ships include the largest ocean-liners, cargo-carriers, and coasters of all types. Besides these are the hundreds and hundreds of ferry-boats, tugs, and river-steamers that are also protected from heat-losses by "85% Magnesia" Coverings.

The aggregate tonnage and horse-power runs into the millions. The service demanded is exceptionally severe. In all weathers, it is essential that an ample supply of hot, dry steam shall be insured. The penalty of failure in many instances would be the total loss of a vessel and her cargo, worth anywhere up to millions of dollars.

No failure has ever been reported. In all the thousands of voyages, in the severest weather of winter, when the ice-incrusted vessels fight the North Atlantic tempests, "85%

Magnesia" steadfastly and successfully performs its allotted task.

In the U. S. NAVY "85% Magnesia" Coverings have been for over thirty years, and are today, the standard pipe- and boiler-covering. The defense of our Nation's commerce upon the ocean highways is safe only as long as our warships can be sure of steam for their engines.

It is "85% Magnesia" that provides that surety.

By specifying "85% Magnesia" coverings for all new construction or replacement work you insure greater fuel economy, lessened bunker or oil-tank space, and great steaming capacity on a given coal consumption.

Write today for the illuminating book on Heat-Losses and Heat-Protection, "Let '85% Magnesia' Defend Your Steam." Exact specifications for the scientific application of "85% Magnesia" are also sent on request.

MAGNESIA  
ASSOCIATION  
of AMERICA



721 Bulletin Bldg.  
Philadelphia  
Penn.

EXECUTIVE COMMITTEE, Wm. A. Macan, Chairman

George D. Crabbe The Philip Carey Co. Cincinnati, Ohio  
Alvin M. Ehret Ehret Magnesia Mfg. Co. Valley Forge, Penna.  
J. R. Swift The Franklin Mfg. Co. Franklin, Penna.  
R. V. Mattison, Jr. Keasbey & Mattison Co. Ambler, Penna.



### RUNS ON KEROSENE Alcohol or Gas Anywhere

A most remarkable invention. No electricity, wires or springs. 1918 Improved patented Models. Runs 8 hours for a cent on kerosene. Quiet-Compact. Brings genuine comfort and satisfaction. Ideal for the sick. A proved emergency 4th energy. Every home and office needs the Wonder Fan. Two Models. Three Sizes.

BE WELL. KEEP COOL. Address  
LAKE BREEZE MOTOR, 547 W. Monroe St., Chicago

### WELL DRILLING WELL PAYS WELL

Own a machine of your own. Cash or easy terms. Many styles and sizes for all purposes. Write for Circular.

WILLIAMS BROS., 434 W. State St., Ithaca, N.Y.



## New Monterey Hotel

Asbury Park New Jersey  
OPEN JUNE 29th, for seventh season  
Capacity 500. All outside rooms. Hot and cold salt water in all bathrooms. White service. Orchestra. Largest, most modern hotel on north Jersey Coast.  
NEW YORK BOOKING OFFICE, 5 W. 40th St.  
W. H. Westwood, Representative  
SHERMAN DENNIS, Manager

## Rockwood Friction.. Transmission

Has solved many power transmission problems—costs less than toothed gears, eliminates expensive repairs and irritating delays, at the same time obtains maximum efficiency from the product. If you have a transmission problem send for our 92-page book "Friction Transmission". It contains valuable data and formulas for manufacturer, engineer, or designer—please mention firm connection.

The  
Rockwood  
Mfg. Co.  
1904  
English  
Ave.



Indian-  
polish,  
Ind.

## The Heroes of Zeebrugge and Ostend

THE group of pictures on our front page, of the "Vindictive" and her crew, tell their own story. They were taken after the return of this 23-year-old cruiser from the daring raid on Zeebrugge, of which we gave particulars last week. The hull of the "Vindictive," it will be remembered, was shielded from the fire of the German shore batteries by the mole alongside of which she lay; but the superstructure, smokestacks, etc., were badly punished; and this shows very clearly in our photograph. In the same view there will be noticed projecting from the boat deck several of the gangways which were used for landing on the parapet. Also of interest are the huge fenders which were hung along the side of the ship to prevent her plating from being torn by the masonry of the mole. The bridge was heavily protected from machine gun and rifle fire and from shell splinters by heavy rope mats and padded canvas mattresses, the center window of the bridge being used as the "peep hole" of this extemporized "conning tower."

The entrance to Ostend harbor, which is formed by two short piers, was not effectively blocked in the former raid; so it was decided to utilize the battle-scarred "Vindictive" and send her in with a volunteer crew to sink herself, concrete-laden, between the piers. The volunteers were secured entirely from the men who had been through the Zeebrugge raid. The former raid, it will be remembered, was in the nature of a surprise—not so, however, this second attack on Ostend.

A member of the expedition, describing the raid says: "As we steamed along, the German searchlights seemed to be everywhere. Ostend harbor was brilliantly lighted. Artificial fog clouds were being used to assist our operation, and the fact that it was hazy was of material help. Most of the crew of the "Vindictive" were taken off when the ship was a little distance from the Ostend piers, only a few officers and men being left to navigate her between the piers and sink her there."

The "Vindictive," after some difficulty found the opening to the harbor, and drove her stem against one of the piers, intending to swing around broadside on. Her stern took bottom, however, and she was eventually sunk diagonally across the entrance. She lies about 175 feet within the piers. Preparatory to the raid, the naval air force dropped bombs on the harbor and the harbor works, causing fires. Later, the airmen were assisted by destroyers and certain monitors which bombarded the enemy positions.

Observation by airmen discloses the fact that the "Vindictive" is lying submerged at an angle of 40 degrees at the eastern entrance. An incomplete but very troublesome blockade has been achieved, and under the conditions of tide and rapid silting up which prevail on the Belgian coast the obstruction will tend to become more serious. The "Vindictive's" crew was rescued by a motor launch which brought off two officers and 38 men, and another motor launch went up alongside and took off a lieutenant and two men.

Berlin, as usual, denies that any serious damage has been done, and that the channel is open; but there is no question that both this base, and that at Zeebrugge have lost much of their usefulness as bases for the German surface and sub-surface raiders. We look to see the work completed in subsequent operations by sea and air.

## Board to Consider War Inventions

TO meet the situation that exists through the inability of existing agencies to handle properly the volume of suggestions made for the better conduct of the war, the War Department has created a new body to handle such suggestions—the Inventions Section, as it is to be called. It is emphasized that this body cannot undertake to deal with vague and general ideas, but is intended only to look into projects which have reached a stage of development properly entitling them to rank as inventions. This by no means implies that they should be patented, or even patentable. Those addressing the Inventions Section

should give the following information: Name and object of the invention; claims for superiority or novelty; results obtained by actual experiment; whether the invention is patented; whether remuneration is expected from the Government for its use; whether it has been before any other agency of the Government; whether the writer is owner or agent; the number of enclosures with the letter. Descriptions and sketches should be in sufficient detail to afford a full understanding. Inventors who are in the habit of making out patent claims should be guided in the matter of completeness by this experience. Should the invention be an explosive or other chemical composition, the ingredients should be stated in full, with all necessary directions for mixing.

The new section will not bear the expenses of preparing drawings and descriptions, nor will it undertake to advance funds for personal or traveling expenses. All matter submitted will, of course, be treated as confidential, and the inventor will be kept informed of the steps taken with reference to his invention. The address is Inventions Section, General Staff, Army War College, Washington, D. C.

## The Current Supplement

TWO interesting articles on airplanes will be found in the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT, No. 2212, for May 25th. That on *Types of Military Airplanes* deals particularly with bombing machines, considering their essential characteristics and the importance and value of the work which they can do. The other, on *Airplane Limits* discusses elements that determine their possible size. The recent sugar shortage has drawn attention to one of our natural resources that has of late been rather neglected. This is maple sugar, and a short history of this valuable product is given in an article entitled *The Maple Tree Helps to Relieve the Sugar Shortage*, which is illustrated by several excellent photographs. Another of the notable lectures on *Problems of Atomic Structure* appears in this issue. *Panama Hats* is a seasonable article that tells where many of these attractive articles of apparel come from, and the material of which they are made. A number of photographs taken on the spot add to the interest of the story. *The Art of Perpetuation* shows how museums are the result of man's acquisitiveness. *The Total Eclipse of the Sun of June 8th, 1918*, gives a great deal of valuable information in relation to this important astronomical event, and will be of special interest to the amateur observer, as it tells him what he can, and should, see. The article is accompanied by useful illustrations. *Volcanic Eruptions* sets forth a possible explanation of certain mechanical and thermodynamic results have heretofore been a mystery. Other articles of value include *Tree Planting for Forests*; *Tale Weight of Spanish Cedar*; *Food from the Forest*; *Odd Paintings by American Indians* and *Covering Power of Lenses*.

## Vinegar from Waste Fruit

THE Agricultural Experiment Station at Berkeley, Cal., has been investigating this subject, with considerable success. It finds that the making of vinegar depends upon two fermentations. The sugar has first to be converted into alcohol and carbonic acid gas by use of yeast; and then the alcohol must be transformed into acetic acid by the usual vinegar bacteria. These two fermentations must be kept separate and distinct to get the best results. Most fruits can be employed more satisfactorily if crushed and fermented before pressing. Pure yeast and a small amount of sulfurous acid should be used to insure good alcoholic fermentation and freedom from lactic bacteria. The fermented juice should be stored several weeks to rid it of yeast and other solid particles, and should then be drawn off the sediment before the acetic fermentation commences. To this juice should be added about one-fourth its volume of new vinegar to start the fermentation on its way properly. Those interested in the process should obtain Bulletin No. 287 of the Station.



# Lost time is the big expense Are you measuring your loss?

**Y**OU hear a lot about fleets of Pierce-Arrow trucks and the extraordinary things they do. You don't hear so much of single truck installations though they are doing even more extraordinary things.

Though fleets of Pierce-Arrow trucks are operated by the largest companies in the country, most Pierce-Arrow owners operate a single truck.

These single trucks bear a greater burden than the fleets, and do their work consistently, day after day, with unfailing dependability.

It is imperative that a single truck should not break down, for there is nothing to replace it.

**There is no truck doing the industrial work of America that has equalled the records of the Pierce-Arrow truck for continuous operation—for the minimum of lost time.**

Lost time is the most important factor in the general efficiency of a truck.

Break downs cost more than repair bills. You can count repair bills. You can't figure lost time.

You know what it costs to hire a substitute truck, but you can't figure the time it loses.

A strange driver on a hired truck loses time by unfamiliarity with your business. Your regular driver would lose time handling the strange truck. You can't figure this decreased efficiency.

And you can't get substitute trucks whenever you want them. When delays violate a contract and entail penalties or sacrifice bonuses, you may figure a money loss, but you don't know what the disorganization costs.

When the truck is an essential link in supplying material to a plant or operation, and workmen must wait for missing material, you can't figure losses.

**Lost time plays so big a part in businesses using transportation, that it should be the first thought in selecting a truck.**

The Pierce-Arrow record of continuous operation and minimum lost time entitles it to first consideration among all trucks.

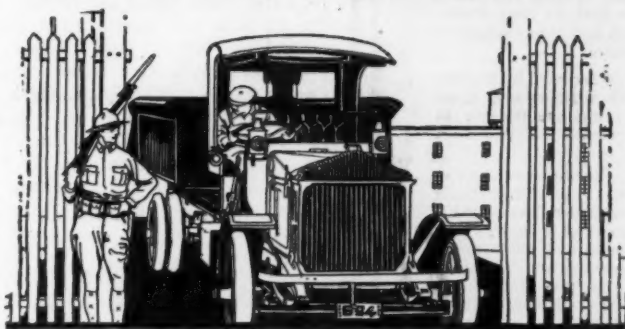
Pierce-Arrow trucks are used in 103 different businesses. Where avoidance of delays is most essential, Pierce-Arrow trucks outnumber tremendously all other makes of trucks.

This is conspicuously true in the contracting business, where penalties are the rule and where bonuses are a big item in profits.

Uninterrupted service has been most important in filling war orders. Pierce-Arrow trucks have paid for themselves and earned huge profits for firms engaged in supplying war materials.

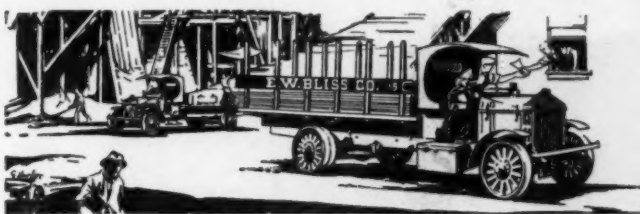
Ask us for specific data of actual performance in lines of business and situations like yours.

## A few striking instances



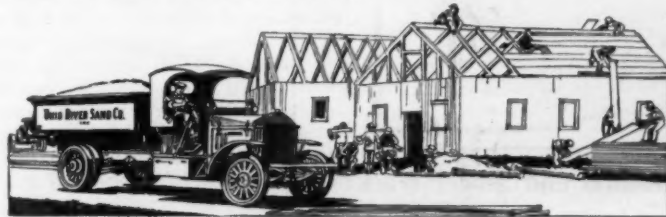
When the WINCHESTER REPEATING ARMS COMPANY enlarged their plant to rush munitions to the Allies, 11 Pierce-Arrow trucks worked day and night, excavating and carrying building material.

When more coal meant more munitions, they hauled 350 tons of coal daily from wharfs  $3\frac{1}{2}$  miles away. Each truck averaged over 10 trips a day—over 70 miles. They saved 36 cents a ton haulage—more than \$39,000 in a single year.



The E. W. BLISS COMPANY, making shells for the war, employed 11 Pierce-Arrows to haul building materials and machinery, and later to carry raw material from distant docks, even hauling heavy loads from Poughkeepsie to Brooklyn.

The speeding up made possible by these trucks, earned thousands of dollars, and saved great sums. In three months they saved \$7,000 in freight demurrage.



When the National Army was called and rush work was necessary, Pierce-Arrow trucks helped build nearly every cantonment. A typical task was performed at Camp Taylor by 6 trucks owned by the OHIO RIVER SAND COMPANY.

Day and night they hauled sand and gravel, making 6 round trips every 10 hours. They carried a larger aggregate load in less time and with less idle time than any other truck employed.

We could multiply similar instances of conspicuous service over and over again.

# PIERCE-ARROW

## Motor Trucks



THE PIERCE-ARROW MOTOR CAR COMPANY. BUFFALO. N. Y.



## Fresh Air Despite the Weather

Ordinary windows, subject to the workers' whims, too often stay shut. If open, they do not keep out rain.

For maximum efficiency, ventilation must be dependable and independent of weather. It is made so by

## Pond CONTINUOUS SASH

WEATHER-PROOF WHEN OPEN

In sawtooth and Pond Truss roofs, monitors and side walls, long lines of Pond Continuous Sash are controlled by the foreman through hand chains or motors. With outlets and inlets properly placed, ventilation is uniform over the entire area.

In ordinary factories positive ventilation is secured by placing a length of Pond Continuous Sash over each window and operating the lengths in groups. Where heat or fumes are present, as in the building here shown, the openings are entirely filled with Pond Continuous Sash.

Examples of the use of Pond Continuous Sash are described in our booklet, "Air, Light and Efficiency." Among them are buildings of the B. F. Goodrich Co., Willys-Overland Co., Ford Motor Co., Remington Arms-U. M. C. Co., and the Domestic Engineering Company.

DAVID LUPTON'S  
SONS COMPANY  
Clearfield and Weikel Sts.  
PHILADELPHIA, PA.

Firestone Tire & Rubber Company, Akron, Ohio, Mechanical Bldg.; Osborn Engineering Co., Engineers. Pond Continuous Sash gives abundant ventilation without allowing rain to damage goods in process. Note the inside columns, also rail at top of building for hanging window cleaners' swings.

Pond Continuous Sash for sawtooths, monitors and side walls. Pond Operating Device for long lines of sash.

**Lupton**  
INVESTMENT VALUE

Lupton Steel Sash  
Pivoted Factory Type  
Counterbalanced Type  
Lupton Rolled Steel Sky-light

## ASBESTOS

We are miners and shippers of Crude Asbestos in any quantity. We produce all grades at our world famous **BELL ASBESTOS MINES** in Canada. We also card fibres, spin yarns, weave cloths, and make all sorts of Asbestos products.

For anything you want in Asbestos, turn to  
**KEASBEY & MATTISON COMPANY**  
DEPT. S-1

AMBLER, PENNA. U. S. A.  
Owners of the world's largest Asbestos Mines

## Experimental and Model Work

Electrical Instruments and Film Machinery.  
Investments Developed.  
Special Tools, Dies, Gear Cutting, Etc.

**HENRY ZUHR, 200 to 204 William St., New York City**

## THE BRIDGEPORT CHAIN CO.

Specialists in Small Wire Shapes & Flat Stampings  
**Bridgeport, Conn.**

## BUBBLING FOUNTAINS FOR ATTACHMENT TO MUNICIPAL SUPPLY

Unequaled  
Keith Bubbler  
Unless otherwise  
specified.

This unit shows our No. 604—16 lbs. of low-cork insulation—12 1/2 coils of 1-3/8 in. brass tubing No. 32 Gauge. Thorough workmanship—selected materials—tested and adopted by those whose judgment is unquestioned.

Many types and sizes. May have coil on bottom as well as on sides. Tasty—convenient—and efficient. Very attractive appearance. Olive brown baked enamel finish—Pure white vitreous cast iron enameled bowl. Fittings—nickel-plated. Wastes above or below the floor.

Send for list of users

Many thousand in use

The Best is the Cheapest

Our lines include: Sanitary Wash Bowls (in Bacterious), Bubbling Fountains (plain and ice cooled), Metal Lockers, Metal Stacks and Pattern Storage Racks, Metal Shelving, Metal Cabinets, Vault Fixtures, Soda Kettles (40 and 60 gallons), Metal Boilers and Churns, Water Mixers, Work Benches, Bench Legs, Full line of Plumbing Fixtures, etc.

**M&Eco**  
Metal Equipment  
For Shop and Factory  
Works and mail address  
Framingham, Mass.  
136 Federal Street  
Boston, Mass.  
Manufacturing Equipment and Engineering Co.

## Strategic Moves of the War

(Concluded from page 478)

British will have entire security for their right flank against the Turks and the latter will be deprived of their great base south of the mountains that run through Armenia. The British advance north of Bagdad stopped some time ago due to the Russian collapse and the cessation of hostilities on the part of Russia in Persia and Armenia. The treaties of peace of Russia with Germany, by means of which Turkey took possession of such important towns as Van, Erzerum, Kars and Batum, proved a strong restraining influence on the progress of the British campaign. The utter absence of railroads and even of suitable ordinary roads in the country renders communications most difficult and causes enormous delays in bringing up supplies and necessary material. Evidently the months of rest have been utilized by the English in bringing stores and ammunition from Egypt and India to Bassora or Busra at the mouth of the Tigris and thence by boat and land transportation to Bagdad. From the latter place both water transportation by the Tigris and the use of the Bagdad railroad to Samara have no doubt greatly facilitated the assembling of all necessary stores. So far it would seem that the forward movement is with three columns—one along the mountain foothills on the east, one up the Tigris proper, and a third up the Euphrates River. The second column was last reported north of Tekrit on the Tigris and the third column had defeated the Turks at Hit and were moving forward towards Aleppo about two hundred and fifty miles away. In Palestine the British took Es Salt east of the Jordan where a branch line of the Hedjaz railway extends. Some advance west of the Jordan and north of Jerusalem were also made. But the Turkish forces must have proved to be in too great strength east of the Jordan, since the British have recently found it necessary to withdraw their main forces to the west bank of the river.

The possible plan and ultimate result of all these operations may be a junction of the forces operating in Mesopotamia and Palestine in the vicinity of Aleppo and a forcing back of the Turks to Adana and possibly behind the Taurus range of mountains.

## Our Sky Army

(Concluded from page 479)

Also more and more fighters are wanted to stop enemy bombers from penetrating behind the Allies' lines, and to protect bombers from attack when going behind the enemy's lines.

Thus we see that the two types of airplanes and of pilots that are most required by the Allies at the moment are precisely the two types which America can produce most quickly and easily. By concentrating on these types America can do most in the shortest possible time to win the war in the air, for by leaving types B alone she will save much labor, material and time which would otherwise be spent on extra fittings, extra work, and extra training.

As a final word though apparently in contradiction of what I have said, let me warn America against the danger of over-standardizing or over-producing any one type of airplane or engine. New requirements and new knowledge grow so rapidly that any airplane or engine which is the best today is out-of-date in three months' time. The nation which will win the war in the air will be the one with the best machines, not the one with the greatest number. Over-standardization means keeping one type in use long after it is out-classed by the enemy. We have suffered from this in England in the past two years, so let America learn by our experiences.

Constant change and improvement in airplanes and engines and guns and bombs is necessary if we are to beat the Germans. The quicker a new and better type is put into the air in the war area, the greater is its advantage over the enemy. To win the war in the air we need to combine the faculty for standardization of Mr. Henry Ford with the quick change facility of Signor Fregoli.

## Surgery in the Navy

(Concluded from page 481)

sailors' teeth, but that is all the more reason for being able to handle, on the hospital ship, anything which is wrong with them. So we have the dental laboratory, just big enough to accommodate one patient and leave elbow room for the dentist. Description is here superfluous; we all know what a dry-land dental office looks like, and this wet-water one is quite after the standard pattern. Indeed, we may say again that until the ship rolls, one would never realize that one was not in the office of the most up-to-date advocate of the art of painless extraction.

After the patient has passed through the throes of any operation or special treatment necessary, and has served his time in the ward, he commences to mend; and it is as necessary to have a convalescent ward in a floating hospital as it is in an immovable one. So the whole section of the upper deck aft is enclosed and officially designated as the solarium. Here the slightly wounded and the convalescent spend their leisure hours in big wicker armchairs or adjustable reclining seats, listening to the phonograph, reading books and magazines, playing such games as may be suited to their condition, and otherwise whiling away the time and awaiting the return of normal strength. This place is practically a sun-parlor; it cannot, of course, be open, and it would be a little chancy to make the entire wall of glass; but there is practically one continuous window around it from one side to the other.

Aside from the direct agencies for caring for the patients, the hospital ship has to carry on certain subsidiary activities. Among other things, an adequate supply of first class milk is essential. But neither milk nor cows can be carried; so we have what the staff has dubbed the mechanical cow. Into this, scientifically known as the emulsifying machine, are put carefully measured portions of powdered milk, butter, fats and water—all of which can be carried on a long voyage; and after proper mixing, perfectly good synthetic grade-A milk flows from the spout. Again, when necessity arises for making or testing serums, etc., or for conducting experiments of one sort or another which cannot be performed upon human victims, the staff of the "Mercy" will not be left without resource; the ship's complement includes a quantity of rabbits and guinea pigs carried for just this purpose. As our picture shows, these little creatures are on excellent terms with one another and with the sailors.

## Changes in the Patent Office

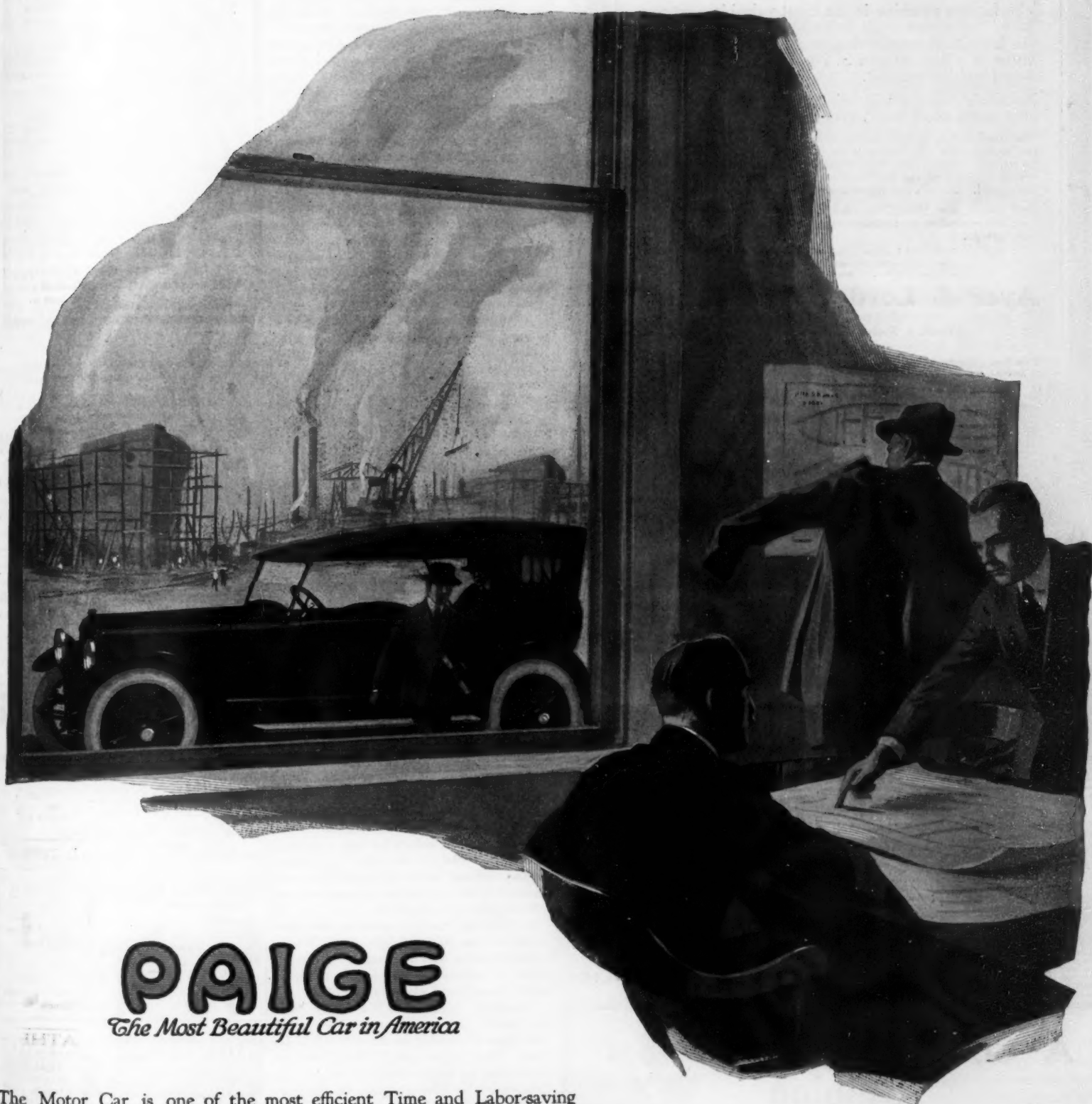
(Concluded from page 484)

quirements with exceptional success. Mr. Giles, as an expert in textile machinery, is familiar with complicated mechanisms, and is thus favorably equipped to attack the novel problems involved in handling the extremely intricate class of air-brakes in his new class. Mr. Underwood is the editor of Underwood's Digest, which has become of invaluable use in the Patent Office and the courts and among the legal fraternity, and he is quite familiar with the legal duties involved in his new position. Mr. Coulston, the new Chief Clerk, has had a wealth of legal experience in the Patent Office, is looked upon as a natural born executive, and has the requisite store of energy to meet the excessive demands the position is subject to.

## Plating of Aluminum with Nickel Now Possible

A PROCESS of nickel-plating aluminum is announced as developed by a large company in Connecticut. It is stated that the new process follows closely the standard process of electroplating other metals and that, as far as is known to the company, it is the only successful process in existence whereby aluminum may be plated with nickel, silver, copper, etc. It is applicable to aluminum in sheets, rods, wire, or tubing, and to aluminum alloyed with other metals as in molded or die castings. It is claimed that nickel-plated aluminum presents a very hard non-corrosive surface susceptible to a very hard finish and that the plated article is much strengthened by the nickel.





# PAIGE

*The Most Beautiful Car in America*

The Motor Car is one of the most efficient Time and Labor-saving devices that has ever been developed. For this reason it has been adopted as *standard field equipment* by wide-awake executives in practically every line of business.

The stern necessities of war have placed a premium on our national productivity—and the motor car has demonstrated that it is economically sound as a producing factor. By conserving Time it multiplies the usefulness of man. By conserving energy, it fosters the broadest and fullest expression of his creative ability.

The Paige is merely *one* of America's high grade motor cars, but we are proud of the part that it is playing in this National Crisis. In no small measure we realize our own responsibility, and the various Paige models will continue to merit the respect and confidence which have been so generously reposed in them.

PAIGE-DETROIT MOTOR CAR COMPANY, DETROIT, MICH.



## The Foundation of Plant Efficiency

The human machine is the most valuable asset you have. Whatever tends to promote the efficiency of the individual employee through improved physical fitness is a gain to you in increased output and reduced production cost.

No single measure will bring such rapid and profitable results as an *Hand L* Wood Block Floor.

The comfortable, resilient nature of this floor protects labor against the fatigue they experience when working on hard, cold floors. Its warmth, dryness, dust-free, sanitary character helps to raise the health standard of the whole shop force. The accident hazard is lowered. There's less waste of spoiled material.

And withal, the *Hand L* Wood Block Floor is practically indestructible—requires no maintenance—grows better, firmer, stronger with service.

Write for booklet telling all about this floor. Our Engineering Department is especially well able to advise you on any flooring problem.

## Ayer & Lord Tie Company

Incorporated  
Dept. S, Railway Exchange, Chicago

Branch Offices:

New York: 2 Rector Street  
Detroit: 406 Empire Bldg.

Cleveland: 201 Society for Savings Bldg.  
Philadelphia: 902 Land Title Bldg.

Easy on the Feet

*Hand L*  
INTERIOR

WOOD BLOCK FLOORS

## FACTORY-TO-RIDER SAVES YOU MONEY

Buy direct and save \$10 to \$20 on a bicycle. **RANGER BICYCLES** now come in 4 styles, colors and sizes. Greatly improved; prices reduced. Other reliable models \$16.75 up. **WE DELIVER FREE** to you on approval and 30 days trial and riding test. Our big **FREE** catalog shows everything new in bicycles and sundries. Write for it. **TIRES**, lamps, wheels, parts and supplies at half usual prices. Do not buy a bicycle, tires, or sundries until you get our wonderful new offers, low prices and liberal terms. A postal brings everything. **HEAD CYCLE COMPANY** Dept. T. 175 Chicago

## THE MIDGET SLIDE RULE



will add, subtract, multiply, divide; solve problems involving even and uneven roots and powers. Also gives the Logarithms of Numbers and the Sines, Cosines, Tangents and Cotangents of all angles. Its operation is very simple; quickly solves any mathematical problem. Durable made of metal. Adapted for shop and office use. Fits the pocket. 3 1/2" in diameter. Price with instructions \$1.00

Send for free descriptive circulars.

Your money back if you are not satisfied. **GILSON SLIDE RULE CO., Niles, Mich.**

## A Continent of Business Opinion

Each section of the country tells, in the Weekly Financial Supplement, how it regards the events of the passing week.

This accumulation of opinion from the business centers of America equips the business man with a highly accurate index of business and financial conditions.

Through special correspondents,

the opinions of representative bankers and business men are obtained from Chicago, Philadelphia, Boston, St. Louis, New Orleans, Baltimore, Washington, Cleveland, Cincinnati, San Francisco, Seattle, St. Paul, Montreal, and Canadian Northwest, the grain communities of Kansas and Nebraska, the cotton communities of the South, and the South American markets.

## The Weekly Financial Supplement

also publishes the most complete stock and bond tables to be found in any publication. Edited by Alexander Dana Noyes.

**SPECIAL OFFER!** Mail the coupon with a dollar bill. We will send the Saturday edition with Financial Supplement for six months.

**The New York Evening Post**

More Than a Newspaper  
— A National Institution

The Evening Post, 20 Vesey St., N. Y.  
Enclosed is \$1.00. Send me The Weekly Financial Supplement for 6 months.  
Name \_\_\_\_\_  
Address \_\_\_\_\_

## Our Winged Postmen

(Concluded from page 477)

which has led through the gradual development of mail transportation in order better to appreciate what the aerial mail carrier means, Lieut. Torrey H. Webb of the Aviation Section, S. C. U. S. A., in the presence of 300 officials and spectators left Belmont Park with the first mail-carrying airplane or "postplane" from the New York end, bound for Philadelphia where a relay awaited him. This event definitely established our first regular mail service through the air, operating on a rigid schedule and open to the public. Belmont Park is an ideal field for our postplane service, because it is but a short distance out of New York City on the Long Island Railroad, and formerly was an important race track. In fact, on the very same field, the first international meet in America was held in 1910, and such famous aviators as Grahame-White, Le Blanc, Moisant, Brookins and Latham participated.

According to schedule, Lieutenant Webb jumped into the cockpit of his powerful biplane and a few moments later, or 11.30 a. m., took the air with his mail cargo. A machine similar to his was on hand and ready in case of trouble of any kind. Two sweeps about the field gained him sufficient altitude and at the same time assured the proper working of the engine. Ten minutes after leaving the field the machine had vanished from view. The matter-of-factness with which the flight started—the total absence of that incessant tinkering which we generally connect with air flights, was totally lacking—gave everyone supreme confidence.

At about the same time Lieut. George L. Boyle was leaving Potomac Park, Washington, D. C., also bound for Philadelphia with a plane carrying a large pouch of mail destined for the Quaker City and New York. His start, which was somewhat delayed, was made in the presence of a notable gathering, including the President and members of the cabinet.

But luck was not with Lieutenant Boyle this day, and he soon experienced trouble which compelled him to come to earth some twenty-five miles out of Washington, breaking the propeller in so doing. Washington and Philadelphia were notified and a special mail truck was sent to the airman's relief. The mail which he was carrying, including a letter to the SCIENTIFIC AMERICAN from its Washington office, was returned to the capital and forwarded the following day by postplane.

It is evident that precautions were not taken to avoid such a failure at the Washington end, as was the case at Belmont Park. It seems that an extra machine would have saved the situation.

Meanwhile Lieutenant Webb sped over the landscapes, waterways and cities of New Jersey, arriving at the relay field in North Philadelphia at 12.30. There he transferred his cargo of mail to Lieut. J. C. Edgerton who took the air six minutes later, heading for Washington. The flight from New York to Washington, after deducting the six minutes intermission in relaying, was made in three hours and twenty minutes, Lieutenant Edgerton landing successfully at Potomac Park at 2.50 P. M. The time of flight, however, was not quite up to the 95 miles-per-hour speed called for by the schedule. Lieut. Howard Culver, who was to act as the relay for the Washington plane, upon hearing of the mishap decided to carry the Philadelphia mail to New York, and he landed at Belmont Park after an uneventful flight at 3.37 P. M., or in one hour and thirty-seven minutes after the start.

## The First Postplane

The machines employed in the inauguration of the air mail service are modified Curtiss biplanes, equipped with single 150-horse-power Hispano-Suiza engines. Among the apparent changes in design are the exhaust pipes of the engine, which instead of turning up and exhausting above the fuselage are led back straight along the fuselage to a perforated and tapering end, much after the fashion of the Spad scout employed on the western front. Another innovation for the Curtiss machine is the

## LEGAL NOTICES

## PATENTS

**IF YOU HAVE AN INVENTION** which you wish to patent you can write fully and freely to Munn & Co. for advice in regard to the best way of obtaining protection. Please send sketches or a model of your invention and a description of the device, explaining its operation.

All communications are strictly confidential. Our vast practice, extending over a period of seventy years, enables us in many cases to advise in regard to patentability without any expense to the client. Our Hand-Book on Patents is sent free on request. This explains our methods, terms, etc., in regard to Patents, Trade Marks, Foreign Patents, etc.

All patents secured through us are described without cost to the patentee in the SCIENTIFIC AMERICAN.

## MUNN & CO.

SOLICITORS OF PATENTS

233 Broadway, Woolworth Building, New York  
And 625 F Street, Washington, D. C.

## Annual Subscription Rates for the Scientific American Publications

Subscription one year..... \$4.00  
Postage prepaid in United States and possessions, Mexico, Cuba and Panama.  
Subscriptions for Foreign Countries, one year, postage prepaid..... \$5.50  
Subscriptions for Canada, postage prepaid.... 4.75

## The Scientific American Publications

Scientific American (established 1845)..... \$4.00  
Scientific American Supplement (established 1876)..... 5.00  
The combined subscription rates and rates to foreign countries, including Canada, will be furnished upon application.

Remit by postal or express money order, bank draft or check.

## Classified Advertisements

Advertising in this column is \$1.00 a line. No less than four nor more than 12 lines accepted. Count seven words to the line. All orders must be accompanied by a remittance.

## LATHES AND SMALL TOOLS

## Friction Disk Drill

FOR LIGHT WORK

Has These Great Advantages. The speed can be instantly changed from 0 to 1600 without stopping or shifting belts. Power applied can be graduated to drive, with equal safety, the smallest or largest drills within its range—a wonderful economy in time and great saving in drill breakage.

Send for Drill Catalogue

W. F. & Jno. Barnes Company

Established 1872

1999 Ruby Street Rockford, Illinois

## SOUTH BEND LATHES

Established in 1890 Making Lathes over 10 years

For the Machine and Repair Shop  
LOW IN PRICE  
18 in. to 36 in. swing  
Straight or Gap Beds  
Send for free catalog giving prices on entire line  
South Bend Lathe Works  
421 Madison St., South Bend, Ind.

## NOVELTIES & PATENTED ARTICLES

MANUFACTURED BY CONTRACT, PUNCHING DIES  
LIGHT AUTOMOBILE STAMPINGS  
& KNOWSLOW STAMPING & TOOL WORKS, CLEVELAND, O.

## MASON'S NEW PAT. WHIP HOIST

for Outrigger hoists. Faster than Elevators, and hoist direct from teams. Saves handling at least expense. Manufactured by VOLNEY W. MASON & CO., Inc. Providence, R. I., U. S. A.

## Chalfonte

Atlantic City, N. J.

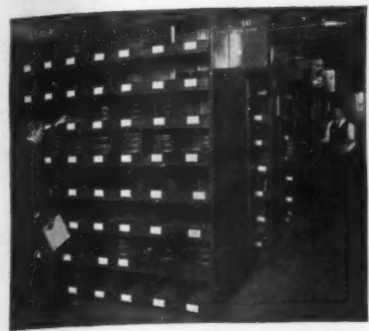
The South Jersey Coast is delightful as this season. Chalfonte appeals to cultivated, interesting people seeking rest and recreation. Modern, 10-story, fireproof. Right on the beach and boardwalk. All sports and pastimes. Golf and yacht club privileges. American Plan Always Open  
THE LEEDS COMPANY



It is best to make reservation ahead for Chalfonte. Write for illustrated booklet and rates.



## DURAND Steel Racks



**ECONOMY** in storage space demands that shelving be easily adjustable to meet changes in stock.

With Durand Steel Racks there need never be waste space. Individual shelves can be removed or shifted in a few moments without tools. They are interchangeable, fit exactly, and are easily taken down and re-erected.

*We are makers of Steel Racks, Bins, Counters, etc., for every kind of merchandise; also Durand Steel Lockers for every need. Write for catalogue.*

### DURAND STEEL LOCKER CO.

1574 Ft. Dearborn Bk. Bldg. Chicago  
974 Vanderbilt Bldg. New York

## ECONOMY renewable FUSES



Replace the Link—Renew the Fuse

at annual fuse maintenance costs 80%. Can be used over and over. An inexpensive "Drop Out" Renewable Link restores a blown Economy Fuse to its original efficiency.

**ECONOMY FUSE & MFG. CO.**  
Kinzie & Orleans Sts., CHICAGO, U.S.A.  
Sole Manufacturers of "ARKLESS"  
the Non-Fuseable Fuse with the  
100% Guaranteed Indicator.  
Also made in Canada at Montreal

### Valuable Books of Instruction and Reference

Scientific American Cyclopedia of Formulas—Concrete Pottery and Garden Furniture—Experimental Science—Handy Man's Workshop and Laboratory.

MUNN & Co., Inc., Publishers, Woolworth Bldg., New York

### Advertising

The patriotic purpose of a national assemblage of advertising men as viewed by President Wilson



"MOBILIZING the best thought and promoting greater activity in all lines of business in these times of stress and emergency."

These words define the motive and object of the San Francisco Convention of the Associated Advertising Clubs of the World, to be held July 7th to 11th, 1918.

Write for interesting booklet  
Convention Board San Francisco, Cal.

auxiliary gasoline tank mounted in the center and just below the top plane.

Instead of having two cockpits, the post-planes are provided with one cockpit to the rear, just clear of the trailing edge of the top plane, and a roomy compartment forward for mail bags, which is covered by a hinged metal hood held closed by straps. It is understood that the War Department furnished twelve of these large training planes for mail purposes, each with a carrying capacity of 300 pounds, and that larger machines with a capacity of 600 pounds are to be used at a later date.

Lieut. Webb carried two pouches containing 2,457 pieces of mail to Philadelphia, while Lieutenant Culver brought to Belmont Park, a pouch containing 350 letters, 200 for distribution in New York and 150 for points beyond.

In addition to the machines which the War Department has placed at the disposal of the postal authorities, all the aviators employed in the service have been detailed from the ranks of flying airmen, as the military men feel that the newly-commissioned fliers will acquire valuable training in piloting the big mail carriers over long cross-country flights. And in this they are certainly right. The experience gained is bound to prove a tremendous asset in the subsequent military activities of these airmen.

It is understood that emergency fields are to be established at Baltimore, Md., Havre de Grace, Md., Wilmington, Del., and at either Princeton or New Brunswick, N. J. In the event of trouble the aviator will either try to make the nearest emergency field or land wherever possible; whereupon the mail sacks will be rushed by motor truck to the nearest railroad station, thence sent forward in care of a courier.

### How to Send the Mail via the Sky Route

The rate of postage for the airplane mail between New York, Philadelphia and Washington is 24 cents an ounce or fraction thereof, which includes special delivery service in all cases, and books and parcels bearing this rate of postage may be accepted for dispatch by airplane when the combined length and girth measurements do not exceed 30 inches.

A distinctive stamp has been issued for this class of mail. It is of 24-cent denomination and measures 3/4-inch long by 3/4-inch high, and depicts an airplane of the type being used in the mail service, in full flight. In a curved line of Roman capital letters above the airplane appear the words "U. S. Postage," and in a straight line below the picture is the word "Cents," with the numerals "24" within circles in both lower corners. The border design is red and the airplane blue, forming with the background the National colors of red, white and blue. While it is preferable to use the distinctive stamp, any letter or parcel meeting the requirements may be accepted when the proper amount of postage in any denomination is attached thereto and the piece of mail is plainly marked "Airplane Mail."

The airplane mail between cities concerned leaves every week day unless it is found impossible to dispatch the mail by airplane on account of heavy rain or dense fog, in which event the mail is forwarded and specially handled on a train leaving the city at about the same hour as would the airplane. Information as to whether dispatch will be made on any day may be had by telephone inquiry at the main post-office or the more important of the sub-stations. In Washington letters have to be at the main post office before 10.45 A. M. to catch the airplane leaving at 11.30, while in New York letters have to be at the main post office by 10 A. M.

### Answering the Question: What Shall We Do With War's Airplanes?

The New York-Philadelphia-Washington postplane service is, we sincerely hope, more than an experiment; and the authorities have assured us that it is not only going to be a permanent institution, but that it is the forerunner of many other similar aerial routes to be established in the near future. Points separated by large bodies of water, points separated by high mountains and precipitous valleys, remote points—all



She draws it on a dark-blue stencil—and quickly Mimeographs it. A thousand tracings of a design or diagram ready within a few minutes! Think what that means. Pictures! What an opportunity to put punch into your sales letters, also organization and factory communications! Lots cheaper than blue-prints—and more effective. Typewriting on the same sheet. The Mimeoscope makes the Mimeograph immensely more useful—and important. Let us show you how it will help you. Get booklet "A4" today. A. B. Dick Company, Chicago—and New York.

**Caution:** The Mimeograph, and our supplies for it, are made to work together. Upset that relationship, the work suffers, valuable time and materials are lost, and our responsibility for quality and output ceases.



## The Woodchucks nibble the Handle but Jim Flynn loves the Blade



This is Jim Flynn with his favorite saw. He bought it fifteen years ago, and has used it ever since. It is a Disston saw. He reports that it has given him wonderful service. And this veteran woodman knows saws.

Jim Flynn is the forest ranger in charge of the section of the St. Lawrence Forest Reservation, New York.

Forest Rangers often have to fight fires with saws. Jim Flynn's other saw, a Disston Cross-cut, has delivered valiant service to check many such fires.

The woodchucks have feasted on the finely-seasoned apple-wood handle of Jim's hand saw. But the finely tempered blade is as good as new.

When you need a saw, ask for a Disston. Our hand saws are used by three out of every four carpenters, because it has the right hang and perfect fit of handle to hand, because its slender, rigid blade cuts with a minimum of friction.

All Disston saws and tools are guaranteed perfect in material and workmanship. Disston files are as famous as Disston Saws.



Send for the free Disston Handbook on Saws

HENRY DISSTON & SONS, Inc.  
PHILADELPHIA, U. S. A.

# DISSTON

## SAWS AND TOOLS



"THE BOY WHO PEGGED SHOES" STARTED IN MANUFACTURING. THE OUTPUT WAS 48 PAIRS A DAY AND FIVE EMPLOYEES CONSTITUTED HIS WHOLE WORKING FORCE.



# W. L. DOUGLAS

"THE SHOE THAT HOLDS ITS SHAPE"

**\$3 \$3.50 \$4 \$4.50 \$5 \$6 \$7 & \$8**

W. L. Douglas name and the retail price is stamped on the bottom of every pair of shoes before they leave the factory. The value is guaranteed and the wearer protected against high prices for inferior shoes. You can save money by wearing W. L. Douglas shoes. The best known shoes in the world



FOR MEN FOR WOMEN

BOYS SHOES  
Best in the World  
\$3 \$2.50 \$2

The quality of W. L. Douglas product is guaranteed by more than 40 years experience in making fine shoes. The smart styles are the leaders in the fashion centres of America. They are made in a well-equipped factory at Brockton, Mass., by the highest paid, skilled shoemakers, under the direction and supervision of experienced men, all working with an honest determination to make the best shoes for the price that money can buy.

The retail prices are the same everywhere. They cost no more in San Francisco than they do in New York. They are always worth the price paid for them.

**CAUTION**—Before you buy be sure W. L. Douglas name and the retail price is stamped on the bottom and the inside top facing. This is your only protection against high prices for inferior shoes. BEWARE OF FRAUD.

Sold by over 9000 shoe dealers and 105 W. L. Douglas stores. If not convenient to call at W. L. Douglas store, ask your local dealer for them. Take no other make. Write for booklet, showing how to order shoes by mail, postage free.

*W. L. Douglas* W. L. DOUGLAS SHOE CO. 163 Spark St., Brockton, Mass.

Factory showing  
30 x 60 ft. room  
in which  
W. L. Douglas  
began manufacturing  
July 6, 1876

Copyright, W. L. Douglas Shoe Co.

## THE BOYS' MAGAZINE AT A BIG DISCOUNT!

In order to introduce THE BOYS' MAGAZINE to thousands of new readers, we will send this superb magazine

**A WHOLE YEAR FOR ONLY 60 CENTS!**

(Regular yearly subscription price \$1.00—Newsstand price \$1.20.)

In addition to quoting this special low price we will give to each new subscriber a copy of our book, "Fifty Ways for Boys to Earn Money." The valuable money making ideas contained in this book are worth a great deal to every live, ambitious boy.

Get this splendid magazine for your boy or for some boy in whom you take a special interest.

THE BOYS' MAGAZINE is one of a very few periodicals that has not increased its subscription price. Besides not increasing our regular price of \$1.00, we are giving you an opportunity of subscribing for a whole year for only 60 cents and at the same time are giving you a really excellent premium in the book described above.

THE BOYS' MAGAZINE is chock-full of just the kind of reading you want your boy to have. Clean, inspiring stories by the best boys authors. Beautifully illustrated throughout, both in black and white and in colors. Practical and instructive departments devoted to Electricity, Mechanics, Athletics and Physical Training, Hunting, Trapping, Camping and Fishing, Photography, Drawing, Stamp and Coin Collecting, Poultry and Pets, Boys' Societies and Clubs, Joe Jolly's Joke Market, Cash Contests, etc., etc.

Send in your order today at this special price and make a certain boy mighty happy for a whole year. We will refund your money immediately if you are not more than pleased with the magazine and the book. (Remit in stamps if more convenient.) This offer is open to new subscribers only.

ADDRESS: THE SCOTT F. REDFIELD CO., 2072 MAIN STREET, SMETHPORT, PA.

## Magical Apparatus

Send 25c for "Grand Catalogue"  
800 pages—40 Engravings, Tricks, Illusions  
Ventriloquist figures, Catalogue Parlor Tricks Free  
MARTINKA & CO., Estab. 1875, 493 Sixth Ave., New York

## THE SCHWERTLE STAMP CO.

STEEL STAMPS LETTERS & FIGURES  
BRIDGEPORT CONN.

## In Emergencies

BASLINE AUTOWLINE proves an excellent substitute for a skid chain. Wind it about a rear tire and you can forget the slippery, greasy going. But don't forget it's the original steel tow line—"The Little Steel Rope with the Big Pull", compact, durable, efficient. Patented snaffle hooks snap on in a wink, and stay put. At dealers, \$4.95 east of the Rockies.

POWERSTEEL AUTOWLOCK, another product, practically thief-proofs your machine or spare tires. Made of weather-proofed Yellow Strand Wire Rope, with strong spring lock. At dealers, \$2.25 east of the Rockies.

POWERSTEEL TRUCKLINES, for power-wagons, are there with their powerful pull. Write for literature.

BRODERICK & BASCOM ROPE CO.  
SAINT LOUIS 11 NEW YORK  
Manufacturers of celebrated Yellow Strand Wire Rope

# BASLINE AUTOWLINE

these are sooner or later to be served by postplanes. Why? Because the well-known rule which says that a straight line is the shortest distance between two points, was never truer than in the case of aerial mail; and there are many places between which a round-about journey by train or boat requiring many hours and even days can and must be reduced to a matter of hours and minutes by the postplane.

Here, then, we have the answer to the problem of the peaceful disposition of battleplanes, bombing planes and reconnaissance planes after the war. They will be converted into carriers of merchandise and passengers and mail, bringing distant peoples into closer relations by reducing to a great extent the present factors of time and distance which are the hand-maids of surface travel.

There is still another point of view with which to regard the subject—and a very important one. This war—our hopes and those of our Allies to the contrary notwithstanding—may not be the last. And if it be not the last, then the next war must needs be far more deadly than the present conflict; and among other features will be the development of aerial fleets on a colossal scale. So in time of peace we shall have to prepare for war, and we shall have to train thousands of airmen and have always ready many thousands of airplanes.

Germany has taught us how this can be done. Before the war Germany had constructed and was using a dozen or more Zeppelins for ostensibly peaceful pursuits, such as passenger-carrying and the rapid transportation of light merchandise. Came the war, and in a few months Germany, through her foresight and through her absolute lack of ideals, was able to send these same Zeppelins over English towns, raining death and destruction from the skies. The peaceful cargoes of bygone days had been replaced by bombs and machine guns, almost over night, so to speak.

The same thing may happen again. A nation may again attempt to take her neighbors unawares, by turning her commercial planes into warplanes over night. So, viewed in its broadest aspect, the airplane postal system has not only a highly commercial value, but it is a potential weapon of defense when an unscrupulous antagonist suddenly releases thousands of airplanes to raid our cities and our homes, and strike at the heart of the nation.

In the meantime, the aerial postal system exists with us.

## Milk—The Food for the Child

AT a conference of the national dairy industry, held in Chicago, April 12th, and 13th, a committee was appointed to confer with the Food Administration in Washington. This committee has requested the Food Administration to announce again its policy with regard to milk.

In response to this request the Food Administration has issued the following: "For the proper nourishment of the child it is essential that milk should be kept in the diet as long as possible. Not only does it contain all the essential food elements in the most available form for ready digestion, but the recent scientific discoveries show it to be especially rich in certain peculiar properties that alone render growth possible."

"This essential quality makes it also of special value in the sick room. In hospitals the wounded recover more rapidly when they have milk."

"For the purpose of stimulating growth, and especially in children, butter fat has no substitute. During this last winter when much agitation arose in some of the larger cities over the price of milk, which was advanced from two to three cents per quart by reason of the rapid rise in the cost of feed and labor, many families among the poorer classes were found giving their children tea and coffee instead of milk. Such methods of feeding fail to nourish the child properly. The widest possible publicity should be carried on through public channels to bring these essential facts to the attention of all mothers."

"In spite of the shortage of milk in Germany, that country has at all hazards maintained the milk ration of children."

## NEW BOOKS, ETC.

**HOME VEGETABLES AND SMALL FRUITS. Their Culture and Preservation.** By Frances Duncan, Chairman Market Committee, Women's National Farm and Garden Association. New York: Charles Scribner's Sons, 1918. 8vo.; 207 pp.; illustrated. Price, \$1.40 net.

Frances Duncan is a writer whose style, like the garden she here advocates, combines charm and practicality. The fenceless and defenseless garden, she holds, has banished the useful product in favor of the merely ornamental, and the new thrift regime will restore the walls and insure the safety of the fruits. Soil, position, plan and cultivation are discussed in minute detail in this her latest volume—an intensive little treatise that should fertilize the mind-soil of the amateur husbandman and result in a rich crop. Seen through the author's eyes, even the cultivation of a kitchen garden is made alluring, and success waits upon enthusiasm. Chapters on the storage of vegetables and on canning and preserving round out a manual that goes to the core of our present needs and gives a definite impulse to that thrift which it is to be hoped may develop from an exalted mood to a settled habit.

**THE BRITISH JOURNAL PHOTOGRAPHIC ALMANAC. 1918.** Edited by George E. Brown, F. I. C. London: Henry Greenwood and Company. 8vo.; 657 pp.; illustrated. Price, paper, 1s. 6d. net; cloth, 2s. 6d. net.

War conditions naturally have not been conducive to a healthy development of the photographic trade in England, and drastic paper rationing has made it necessary to reduce somewhat the text of this annual. Yet it still stands as a monument to the patient and courageous efforts of the trade; its epitome of progress gives the exhibitions and events of the past year, presents new applications in apparatus, processes and methods, and cites the progress made in color photography. The chemical, exposure and optical tables constitute a helpful section of the work, and there are descriptive lists of the British photographic societies and bodies, with many other features of interest.

**PRESTOCARD SOLDIERS' FRENCH VOCABULARY.** Glen Ridge, N. J.: The Prestocard Company. Price, \$1.25.

Why not make a game of it, this study of the French language? Here are 400 cards, with French phrases and pronunciation on one side and the English translation on the other. But the most striking feature is the shape of the cards, which we are told is that of the State of Nevada; however that may be, this feature makes the cards self-arranging, in that all can be instantly reduced to one position—either French or English toward the reader, as he may require. As the phrases are mastered the cards may be placed to the rear of the filing box, and only those remaining to be memorized kept to the front. It is a decidedly ingenious application of the card system to education.

**NELSON'S HISTORY OF THE WAR. Vol. XVIII.** By John Buchan. New York and London: Thomas Nelson and Sons, Ltd. 8vo.; 280 pp.; illustrated.

The 18th volume of this popular history recounts events from the German overtures for peace in the autumn of 1916 to the American declaration of war. It describes the end of the Roumanian retreat, the clearing of Sinal and the fall of Bagdad, the Russian revolution, the situation in Austria, the new government in Britain, and "the breaking of American patience." Appendices give documents connected with the German and American peace notes, President Wilson's message to Congress, and dispatches and reports dealing with the Sinal operations and the Bagdad successes. Fourteen maps and plans are valuable aids to a clear understanding of progress in the various theaters of war and the text is so written as to put within the vision of the reader all the important developments of the period with which it concerns itself.

**PRINTING FOR PROFIT.** By Charles Francis. New York and Indianapolis: The Bobbs-Merrill Company. 8vo.; 404 pp.; illustrated. Price, \$3.

Most of the followers of Gutenberg agree that printing is "a precarious occupation"; but Mr. Francis's fifty years of printing experience on three continents has convinced him that honest and efficient work can be made as profitable as it is pleasant; certainly his reminiscences and methods are worthy of the most respectful consideration. He gives us a delightful historical résumé, in text and illustration, of this, the third largest industry of the United States, gently conducting us from the flimsy composition of the "70's" that now appears so crude to our sophisticated eyes, through forgotten processes to present-day refinements. He then takes up the conditions necessary to profit-making, and while the monetary return is necessarily a basic consideration, he prefers that the word "profit" as it appears in the title should be given the wider definition of "any accession or increase of good from labor and exertion." We have instruction in financing, papers on the making of magazines and trade catalogs, problems of salesmanship, and office advertising. Small and large plants are conversationally dealt with, and the difficulties that confront them are touched upon with the hand of a master. The volume itself is an embodiment of good taste in presswork and offers to printers and advertisers an aid that may not lightly be refused.



## The Victory Road

Enlisted in the country's cause—waging a winning war against transportation delays—MACK Trucks are diverting from over-burdened railroads many tons of crude and manufactured material so that the "fighter behind the fighting front" can receive implements and seeds and supply us and our allies with our greatest need—sufficient food. Long distance transportation by motor truck is now a practical reality. To many manufacturers it is a necessity. MACK Trucks make it an economy.

MACK performance under all conditions and in every field is a matter of record. The knowledge gained and gathered by our transportation engineers is at the disposal of any business contemplating the addition of motor trucks to its present equipment or displacing other methods of hauling.

MACK capacities: 1 to 7½ tons; with trailers, to 15 tons.

*For catalog and complete information address Dept. I*

**INTERNATIONAL MOTOR COMPANY  
NEW YORK**



# "PERFORMANCE COUNTS"





## Helping Save Foodstuffs for the Nation's Fighters

The summons of the country goes forth—

"Save the meat—wheat—fats for the fighter.

"Give the fruits and vegetables grown at home a more important place on your table."

Here again the motor truck helps vitally in the response to America's needs.

With their Federals, the farmers, gardeners, truck growers far from

the city markets bring their produce fresh and early to the stalls.

They return with less time lost on the road—able to give more attention to increasing and improving their produce.

This is still another service Federals are rendering our country at war, none the less patriotic we hope, because it is also profitable to the growers and beneficial to their customers.

*Write for Federal "Traffic News"*

Federal Motor Truck Company  
Detroit Michigan





THE TRUE STORY OF THE LIBERTY MOTOR

MAY 31 1918  
MAY 31 1918  
MAY 31 1918  
**SCIENTIFIC AMERICAN**



A FLEET OF MERCHANTMEN UNDER CONVOY AS SEEN FROM A TOWED BALLOON [See page 499]



*The Annual*

# Roll Call

*of* WHITE TRUCK FLEETS



ACCORDING to its custom for a number of years, The White Company is publishing its annual Roll Call of fleet installations (ten trucks or more) in national magazines and metropolitan newspapers.

The following summary for each year indicates the rate of growth of the installations which comprise ten trucks or more:

1910 . . 54 trucks	1914 . . 1746 trucks
1911 . . 191 trucks	1915 . . 2604 trucks
1912 . . 508 trucks	1916 . . 5132 trucks
1913 . . 1021 trucks	Now . . 7433 trucks

There is now a total of 2,153 White fleets in active service, aggregating 23,226 trucks, exclusive of all single installations.

The company takes a just pride in issuing this annual statement. Its year-to-year growth is so much more convincing than any argument—so much more extensive than any other figures presented in the industry.

*A copy of the 1918 Roll Call will be sent to anyone interested on request*

THE WHITE COMPANY

883 East 79th Street  
CLEVELAND

# The Significance of Extra Tread Rubber

THE thousands of "change overs" from solid tires of other makes to Goodrich De Luxe have been attributed to just one thing—the exceptional advantages afforded by THE EXTRA TREAD RUBBER in De Luxe.

The scientific distribution of *more* rubber on the tread at the point of contact with the road means a *greater margin of safety for the motor truck—more rubber to wear through*. Thus it becomes an economical proposition.

But in the protection of the mechanism and the working parts of the truck itself De Luxe attains its real significance.

Its GREATER CUSHION is of such volume as *to smother within the rubber itself* those strains and jars that penetrate thinner tires and reach the truck's mechanism.

And on a straight mileage basis De Luxe *must outwear other makes* because of ITS GREATER VOLUME OF WEAR-RESISTING RUBBER.

You want economy in operation. You want a big return from your truck investment. De Luxe will give it to you.

(Made in 4, 5, 6, 7, 8 and 10-inch widths)

*Branches and Distributors in  
all truck centers*

**THE B.F. GOODRICH RUBBER COMPANY**

The City of Goodrich—Akron, Ohio

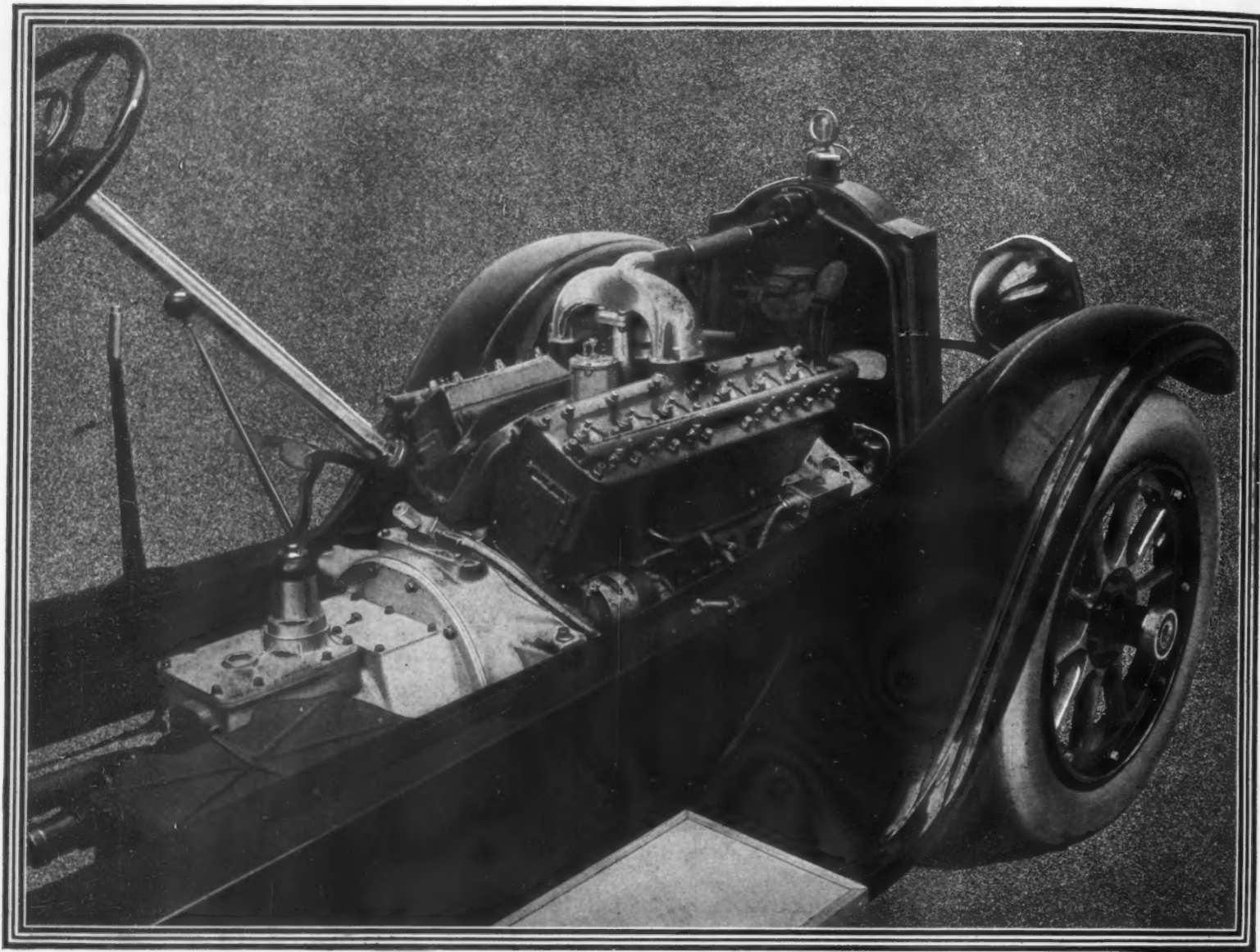


*Extra Tread Rubber—  
Your Guarantee of  
Uninterrupted Service*



# GOODRICH DE LUXE TRUCK TIRES





*Twenty thousand owners call it a perfected mechanism—the Packard Twin Six power plant.*



WIN SIX QUALITY is revealed when you lift the hood. Clean, symmetrical lines give a true picture of simple and sound design. That outward beauty of Packard workmanship is a symbol of intrinsic worth. Every detail a hall-mark of Packard performance, smoothness of action, range of ability, economy of tires and low cost of upkeep.

Owners call the Twin Six the embodiment of eager power under perfect control. Its war-time utility is expressed in terms of transportation, first-class travel over any road.

*Ask the man who owns one*

PACKARD MOTOR CAR COMPANY, DETROIT, MICHIGAN